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[OFFICIAL NOTICE.]

Twenty-Ninth Annual Meeting, Western Gas Association.

WESTERN GAS ASSOCIATION,
OFFICE OF THE SECRETARY,
NEW ALBANY, IND., March 21st, 1906.

To the Members of the Western Gas Association: The Twenty-ninth annual meeting of the Western Gas Association will be held in the Hollenden House, Cleveland, O., May 16, 17 and 18, and will be called to order at 10 A.M., by the President, Mr. Paul Doty, of St. Paul, Minn.

The Hollenden, prepared to accommodate 300 guests and furnish a room suitable for the sessions of the Association, announces the following rates. European plan: Rooms with running water, $1.50 and $2; rooms with bath, $2.50, $3, $3.50 and $4; double-bedded rooms with bath, $4 to $5.

The Hollenden, while conducted on the European plan, furnishes meals as follows: Club breakfast—50 cents and upwards; an 8-course lunch for 50, 60 and 75 cents; table d'hote dinner, 65 cents.

The following papers will be presented to the Association:

"Firing of Retort Benches by Battery Producers," by Mr. Fred. Bredel, Milwaukee, Wis.

"Electrolysis of Gas Mains," by Mr. M. R. Bump, Denver, Col.

"The Relation of Gas to Our Modern Life," by Mrs. O. N. Guldlin, Fort Wayne, Ind.

"General Data on Artificial Gas Properties," by Mr. W. E. Steinwedell, Cleveland, O.

"Notes on Carbonization," by Mr. W. E. Hartman, Joliet, Ills.

"Regulation of Rates," by Mr. Geo. McLean, Dubuque, Ia.

"Change in Grade of Mains at Galveston," by Mr. John Gimper, Galveston, Tex.

"Labor Saving Machinery for Medium Sized Retort Houses," by Mr. F. H. Shelton, Philadelphia, Pa.

"Rates and the Additional Business System of Costs," by Mr. W. H. Gardiner, Jr., Boston, Mass.

"Some Brief Notes on Capacities of Water Gas Sets," by Mr. Rollin Norris, Philadelphia, Pa.

"A Balance between Calorific Value and Candle Power in Water Gas," by Mr. T. D. Miller, New Orleans, La.

"The Utilization of Tar in a Water Gas Apparatus," by Mr. Geo. H. Waring, Omaha, Neb.

"Water Gas Practice," by Mr. D. G. Fisher, St. Louis, Mo.

"Extraction of Tar from Water Gas," by Mr. E. H. Earnshaw, Cincinnati, O.

"The Mutual Advantage to be Derived through Co-operation between Engineering Schools and Those Engaged in the Gas Business," by Prof. Chas. F. Burgess, University of Wisconsin.

"The Relations between Gas Companies and their Employees," by Mr. Joseph M. Berkley, Los Angeles, Cal.

"Wrinkle Department," Edited by Mr. B. McAdam, Milwaukee, Wis.

"A Lecture on Industrial Betterment," by Dr. Wm. H. Tolman, New York.

"A Lecture on Engineering of Illumination," by Mr. Van Rensselaer Lansingh, New York.

A banquet will be arranged for Thursday night and an entertainment provided for the ladies. Further details will appear in a future announcement.

Arrangements with the various Passenger Associations will be made for reduced rates on the certificate plan. The Secretary will be pleased to furnish application blanks to those wishing to become members of the Association.

A cordial invitation is extended to members of kindred Associations to be present.

JAS. W. DUNBAR, Secretary.

BRIEFLY TOLD.

NOTES.—

THE *Iron Age* says it is not generally known among the members of the American Society of Mechanical Engineers that Prof. F. R. Hutton, who has been the secretary for nearly 25 years, presented to the council at its meeting in January his letter of resignation. It is his belief that the work of the society now requires a secretary who can devote his whole time to the office. Professor Hutton's position as head of the department of mechanical engineering of Columbia University makes it impracticable for him to do this. The resignation was

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not accepted, but will be referred to the members of the council who were not present at the January meeting, and it is hoped that some compromise may be effected which will allow the retaining of the services of Professor Hutton for the conducting of meetings and certain other functions in which he has been heretofore indispensable, and that another man may be employed to attend to the detail work of the secretary's office. The latter will have the title of secretary, and it is suggested that Professor Hutton be designated as honorary secretary. At the meeting of the Council March 27 this general plan was approved and a special committee was appointed to select a new man and arrange the details of the suggested change.

"J. M. O.," writing from Rochester, Ind., under date of the 10th inst. informs us that the the shareholders in the Rochester Gas and Fuel Company, met in La Porte, Ind., the 9th inst., to complete the organization of the Company, at which meeting the following officers were elected: President, Wm. A. Martin; Vice-President, E. F. Michael; Treasurer, Emmett Scott, Jr.; General Manager and Purchasing Agent, Fred, W. Freese; Secretary and Superintendent, John M. Ott. Construction work was commenced on the 11th inst., and it is said the plant will be completed by July 15th.

SUPERINTENDENT A. F. BIGELOW, of the Allentown (Pa.) Gas Company, has been authorized to announce that the new net selling rate of $1.10 per 1,000 cubic feet for all purposes will become effective May 1st.

At the organization meeting of the People's Gas Light and Coke Company, of Chicago, the officers elected were: Chairman, C. K. G. Billings; President, George O. Knepp; Vice-President, A. N. Brady; Second Vice-President, James F. Meagher; Third Vice-President, C. K. Wooster; General Manager, W. P. Martin; Secretary, L. A. Wiley; Treasurer, W. S. McCrea; Assistant Secretary, W. M. Flook; Assistant Treasurer, J. S. Zimmerman; Second Assistant Secretary and Treasurer, F. A. Crane. The changes from the former executives were the naming of Jas. F. Meagher as Second Vice-President in place of Walton Ferguson and the naming Wm. Flook to succeed H. W. Olcott as Assistant Secretary.

MR. EUGENE RIGGS has resigned from the bookkeeping division of the Lockport (N. Y.) Gas and Electric Light Company.

WE understand that the reduced selling rate at Harrisburg, Pa., goes into effect the 1st inst. As before stated the cut is from $1.25 to $1.10 per 1,000.

Coal and Coke Exports for the Year 1905.

The coal and coke exports of the United States in the calendar year 1905 reached a total of nearly 9,800,000 gross tons, valued at more than $31,000,000. The exports of anthracite coal were 2,229,983 tons, valued at $11,104,654; of bituminous coal, 6,959,265 tons, valued at $17,867,964; of coke, 599,054 tons, valued at $2,243,010. Almost all the exports of anthracite coal were to Canada, and over two-thirds of the exports of bituminous coal. The table below shows the export movement in 1905 as compared with 1904 and 1903 and the countries to which coal was exported:

	1905.	1904.	1903
British North America, anthracite	2,187,450	2,193,746	1,983,562
Bituminous	4,777,180	4,384,208	4,552,301
Mexico, anthracite	1,385	789	815
Bituminous	925,785	879,958	845,597
Cuba, anthracite	29,035	25,030	18,476
Bituminous	535,350	494,197	421,283
Other West Indies and Bermuda:			
Anthracite	9,239	6,476	4,327
Bituminous	291,537	247,109	216,169
Italy, anthracite	5	728	1
Bituminous	68,364	69,202	49,219
Other Europe, anthracite	382	33	10
Bituminous	32,526	74,391	35,959
Other countries, anthracite	2,487	1,590	1,666
Bituminous	328,523	196,061	182,713
Totals	9,189,248	8,573,518	8,312,098
Coke	599,054	523,090	416,385

The exports of coal from the United States have practically doubled since 1895. The distribution of coke exports is not given in the Government statistics, but such shipments are largely to Mexico. Great Britain exports about 5 times as much coal and Germany about twice as much as the United States.

[OFFICIAL REPORT.—REVISED BY THE SECRETARY.—CONCLUDED FROM PAGE 623.]

THIRTY-SIXTH ANNUAL MEETING, NEW ENGLAND ASSOCIATION OF GAS ENGINEERS.

HELD AT YOUNG'S HOTEL, BOSTON, MASS., FEB. 20 AND 21, 1906.

SECOND DAY—FEBRUARY 21—MORNING SESSION.

Concluding the Discussion on the paper by Mr. H. E. White, New Haven, Conn.

Mr. Nute—It would be interesting to me, and perhaps to some of the other members, to inquire what use Mr. White makes of the figures that are obtained on the back of this report for street mains laid, the material used and labor form. It seems to me that information does not show the actual cost of the main, and is, therefore, absolutely valueless. We know that a great many charges would not be shown up on a report of that kind. Teaming and express charges such as those on material of one kind and another, dynamite, blasting, etc., in case we have to blast, and many other little charges, amount to a good deal in the aggregate. Does he keep track of charges against each extension by opening a ledger account against each extension, or a ledger account against each size of main, or some other method by which he knows what the cost of his mains is, and whether or not he does, what use he makes of this on the back? It seems to me it is apt to be of no use at all.

Mr. White—The main object of the form on the back of the main order is that the stock clerk will know what material has gone out. That is priced up and marked off the stock cards. That is the primary object of the material. During the past 4 years I have made it a practice to take these orders, and we know positively that the amount is charged against a particular extension as it appears on the back of the order. As the gentleman said, there are a great many other incidental charges which do not appear, some of which charges we can approximate very closely, such as teaming and car fare for the men when they are working out quite a distance from the center. After the year's work is completed we make a summary, and the sum total of the amount that is charged to construction is obtained. The difference between the total amount charged to construction and the total amounts as appear on the back of the main orders, is the general charge. That general charge is proportioned among all the extensions made throughout the year. During the past year it amounted to 14 per cent. and a fraction, I forget just what the fraction was. It seems to me that that is a very close approximation, and is somewhat reliable, and in that way it helps us to find what the cost per foot is for different size mains for our year's work. If you take it for a monthly or a quarterly report I think it is valueless, but for the year it comes out very close.

The President—Has Mr. Prichard any data or information to give the meeting?

Mr. Prichard—Theoretically we do in Lynn, as has been indicated here, carefully examine the cost, and then, if it seems unreasonable, we say that we will not lay it. Practically we get at the cost and lay it.

The President—Perhaps Mr. Witherby has the same mental attitude towards his customers?

Mr. Witherby—I only wish we had. I think the people of New Haven are most fortunate indeed in having such liberal treatment, and I only wish that all gas companies—at least the financial end of them—could be made to see it in the same way that Mr. Nettleton has evidently impressed his people. I know it is almost an impossibility to get our people to realize that liberal treatment is actually necessary, and we have been held down I think in the past 5 or 6 years to the restriction of the limit of 100 feet for every customer. Free services have in the main been used from the main to the house, with the usual connections, but in the last 2 or 3 years we have been even forced back to the point of the curb line only. I think Mr. Nettleton's plan and general scheme of the operation are by far the best. I only wish we all could be led to see it in the same way. I would really like to know how Mr. Nettleton gets them to see it in that way. I will see him privately and get some points from him.

The President—I would like to ask a question. In developing a new territory is it the custom to make a canvass first and get pledges for stoves or other service prior to laying the mains; and if so, to what extent?

Mr. White—When the territory is doubtful we send a canvasser. Usually we don't have to go out and canvass much for new mains. The people come to us; they want them. But if it is quite a long extension and the houses are few we try to get every house, and we get what we call a provisional order, sending a canvasser to ascertain whether the parties will use gas if the main is extended. That gives us a little

closer estimate. Ordinarily you can come pretty near counting that every new house wants gas.

Mr. Nettleton—Since the 1st of December our price has been $1.05, with 10 cents off for prompt payment before the 10th of the month, making the net price 95 cents. Then we have a discount of 5, 10 and 15 cents to large customers, varying with the amount consumed.

The President—Mr. Barnes, have you anything of interest or variety to say to us as to the custom in Cambridge?

Mr. Barnes—Our custom is very much as has been outlined here. We charge from the fence line through the cellar wall for service pipe and also for the meter connection. In the extension of mains it depends a good deal on what the outlook is. If a man asks us to run a main through a street we canvass that street thoroughly and see how many customers we can get. I don't think we have any hard and fast rule. Mr. Allyn, our Superintendent, has that matter under his control. He is generally very liberal in the matter, and if he thinks I want the main run in there he is generally ready to run it. Something depends upon how hard the man pushes for it; but ordinarily we have found it expedient, I think, to run mains wherever they were asked for. Occasionally we have to turn applications down.

The President—Do you find much criticism of the Company, or any hesitancy upon the part of the consumer in paying his share of service pipe and meter connections?

Mr. Barnes—That always comes upon the owner of the property.

The President—On the landlord?

Mr. Barnes—The landlord or the owner of the property pays that. Sometimes the tenant will pay it when the landlord will not, for the sake of getting the gas. We charge for 1¼ service 24 cents per running foot. That covers all expenses from the fence line in, and the meter connections will average perhaps $3.

The President—And your price is what?

Mr. Barnes—Ninety cents.

The President—Ninety cents, net?

Mr. Barnes—$1.10, with 20 cents discount, if paid before the 10th day of the month.

The President—You are very fortunate.

Mr. Barnes—One question I would like to ask Mr. White. Does he find in making these records that every house has a street number? We find in trying to keep our records that probably not one house in five has a street number as a business. We know that fully 10 per cent. of our customers move every year; probably more than that. Three-quarters of our customers are on prepayment meters, and it is not possible to tell just what the percentage of removals is in a year. The fact that only about 1 house in 5 has a visible number is one of the greatest points that we have to contend with. Every year I think I will buy a lot of street numbers and give them away to everybody that applies for a gas meter.

Mr. White—In a great many instances we run a service to a house before it is completed, and in that case it very seldom has a number. Sometimes the owner or tenant knows the number that will be put on the house when it is finished, but in new districts there are a great many blank numbers between and they do not know. That is where having maps comes in. At the end of a month, after the stock used has been taken off the service orders, and the other information is transferred to the card as shown in Forms 12 and 13, the service is plotted on a map. If that house does not appear on the map we go out and measure the house. Usually by that time it has a number. In that way we keep track of it.

On motion of Mr. Barnum (seconded by Mr. J. J. Humphreys) a vote of thanks was given to Mr. White for his admirable paper.

The President—The committee duly appointed some time since upon the matter of electrolysis is ready to report. The Association will give close attention to Mr. Prichard's reading of the report.

Report of Committee on Electrolysis.

Mr. Prichard—The committee understood that, in making this report, they were doing it for the purpose of opening a discussion on the matter, therefore they have tried to reduce it to the lowest possible terms.

Your Committee on Electrolysis have, by mail and otherwise, made inquiry as to the damage being done to the pipes belonging to the various companies represented in this Association. Although some years ago it was feared great damage would be done to gas pipes by the return current from the electric railroads, the reports received show no damage in many places, and when damage has occurred it has been of local character.

Electric roads, which are the source of practically all electrical currents which affect our pipes, after using the current for the purposes of motive power for the car, return it to the rail. It then goes back to the power station, not through the path of least resistance, but through all paths, the lesser amounts passing through the paths of greater resistance. We may, therefore, expect to find some current flowing through all our pipes which are in proximity to electric rails. If these pipes become carriers of current to any extent, and at some point in their length there is offered a better path for a portion of the current to flow through, it will leave the gas pipe, and in leaving will take with it a portion of the iron, and we have electrolysis.

It appears the duty of the electric roads, having let loose this destructive agent, and knowing its destructive effect, to themselves provide a path of sufficiently low resistance to take back to their power plant the larger portion. This can readily be done by proper bonding of rails, by underground conductors bonded to the rails, and by overhead conductors connected to the rails at intervals. Proper attention to this would so minimize the current flowing through the gas pipes that no harmful results would follow in most cases. Failure to provide reasonable returns would seem sufficient cause for legal redress.

On the part of the gas company, it appears that the way to minimize electrolysis is to provide suitable metallic conductors to take any current which may be flowing through the pipes back to the railroad return wires, if sufficient, or to the power station, and to do anything which can be done to increase the resistance of the pipes to the flow of electric current, thus reducing the amount to be disposed of. Coating the pipe with heavy tar or other insulating compound, or covering with tile, interposes resistance in the path of the current. Cement or insulating joints increase the resistance, but the insulating joint must be at every joint, particularly if the soil is wet and salty or otherwise a good conductor, since a small difference in voltage may be sufficient to cause the current to go around the insulation, causing electrolysis at each joint. In a recent notable example, when the pipe wss carrying an unduly large current, probably due to defective work by the railroad, the insulated joints were several hundred feet apart, the difference in voltage in the adjoining sections combined perhaps with the good conducting quality of the soil, was sufficient to cause the current to pass around the joints, causing destructive electrolysis at each joint.

Probably of the suggested remedies, the providing by the electric railroad of ample opportunity for the return of the current to the power station is the only safe one. If its return is not ample any electrical connection of the gas pipes to the return wire might prove an opportunity for the return current to increase in amount in the pipe, escaping later to good ground, afforded by an adjacent water pipe or wet soil, with consequent damage. Insulation, defective at any one point, could localize the discharge of current and cause quick destruction, while the possibilities of insulated joints causing trouble have been referred to.

It has been suggested that the adoption of the alternating current for operating street cars would remedy the trouble. This does not appear to be probable, for, although it undoubtedly would reduce in amount the damage done, it would be difficult to locate the district in which it was taking place till too late, while with the present direct current an electrical survey will locate the dangerous area easily.

Chas. F. Prichard,
Chas. H. Nettleton,
Horace A. Allyn,
} Committee.

Discussion.

The President—This is a very important subject and many are deeply interested in this great and growing menace. I trust they will take part in the discussion, giving the meeting the advantage of their experience or asking pertinent and direct questions. Mr. Learned, what experience, if any, have you had in Newton and Watertown?

Mr. W. A. Learned—There is one section near a power station at Newtonville where the water pipes have been affected, so when we laid a 12-inch gas pipe past that power house we insulated every joint. When I laid a 6-inch cast iron pipe for our high pressure line every one of those joints was insulated. The pipe was parallel to the railroad for about 2 miles and about 3 feet away. The surveys we made on that line of pipe show no electrolysis whatever, and we can hardly detect any electricity going on to the line.

The President—A cast iron pipe?

Mr. Learned—Yes.

Mr. Allyn—I should like to inquire of Mr. Learned in what way he insulated his 12-inch pipe?

Mr. Learned—Using an ordinary bell-and-spigot pipe and an insulated compound where you would put the lead or cement. At the end

of the bell was a Dresser clamp, to keep this compound in place, and between the spigot and the bell on the inside was a small wooden ring. That made the insulated joint.

Mr. Allen—I would like to ask Mr. Learned if that was not illustrated by him once before during one of these meetings 2 or 3 years ago?

Mr. Learned—Yes; it was.

The President—Mr. Witherby, you must have had some experience?

Mr. Witherby—Yes, Mr. President, we have had considerable experience, and some of it was exceedingly disastrous and expensive. The Committee's report mentions, among the first things, no report of damage, from some inquiries that this Committee has evidently instituted. It seems to me if the majority of companies it has communicated with have reported that there has been no damage in any way, it must be from a lack of knowledge of their actual conditions. I don't believe there is a distribution system in the United States (that is making it very broad) where there is an overhead trolley line in existence but that is being damaged. It may be that it is not of sufficient importance perhaps up to the present time to have caused any serious disaster, but a careful electrolytic survey of the district will show damage to a greater or lesser extent. I think it is time for all of us to realize the facts and conditions. If we have not had a survey made of our distribution system I think it is one of the most necessary things to-day to do it at once. A careful survey will show that damage is being done in every case; I don't think there is one exception. As to legal redress, it has been up to the present time impossible to have taken a case far enough so that any court has gone on record as taking a decided stand in making the trolley companies liable, or exonerating them in any way. Wherever the question has been brought up, and it has gone into a large amount of money, there has always been a settlement of some kind. There has never yet, that I know of, been a court decision that we can point to that would act as a precedent for any future action. If there is one I would be very glad indeed to know of it. Perhaps the one thing that must be brought to the front at this time is the question of the kind of soil. Take a company that is operating in a high, dry section, where the soil in which its distribution system is dry and sandy, perhaps at those points, unless some very peculiar conditions existed on account of the railroad bonding or the return current, they would be as nearly immune to the trouble as could be. On the other hand, in filled ground, where there are all sorts of acids in the soil, in wet, marshy places, where the trolley conditions are at all bad, the pipes of gas and water companies are bound to suffer. I don't think there is a case in existence where it is not an absolute fact. When it comes to the question of alternating or direct current there may be a slight advantage—that is, from the gas company's standpoint—in favor of alternating currents, but the damage is still going on just the same. I think it is time that this Association as a body should put itself on record, and be willing to take up a fight, if necessary, in a united way, for the benefit of the entire fraternity. I don't think there is any one thing that is going to make as much widespread damage and cost so much money to the gas companies in the end as this. We can talk about economies in operation and management, but they are all going to be offset on account of the repair account that is bound to come in the end from this one thing. I don't believe that 10 per cent. of us really realize the immense amount of damage that is being done. I think it is time some of us took a very active stand on it.

The President—A most remarkable article appeared in the American Gas Light Journal, dated January 22d, prepared for the Journal by Mr. William H. Cole, of Newton, Mass. Perhaps you remember it. It is a very long article. But if some of the members have not read it I wish they would make a memorandum to read the article. It is called "Electrolytic Action on Gas Mains." There is also another article on the same subject, on page 190, January 29th.

Vice-President McGregor assumed the chair.

The Vice-President—We would be glad to hear from any other member who can give any additional information on the subject under discussion. Mr. Witherby has given it good, large, liberal, free treatment, and has added much to the general knowledge. Mr. Gardiner, have you anything that you could contribute on this subject?

Mr. Gardiner—No, sir; I have no data on that.

The Vice-President—Has any other member?

Mr. Nettleton—I would like to say a word in connection with Mr. Witherby's suggestion as to the Associations taking a stand and practically demanding from the street railways that they do something. Of course, each one speaks from his own personal experience, and his ideas and judgment are governed very largely by that experience. There are street railway companies and street railway companies. Those in the section of Connecticut where I am located are meeting this subject in a very fair spirit. There are practically only two corporations, one the Connecticut Railway and Lighting Company, which is controlled by the U. G. I. Company, and they have every reason to try to avoid damaging gas pipes, and I feel confident they are doing it. Among other places, they operate the street railway in Derby, Conn. The other is the Consolidated Railway, which is owned by the New York, New Haven & Hartford, and this operates the street railways in New Haven. Those two companies take in practically all the street railways in Connecticut. At New Haven we have had considerable trouble, particularly in the neighborhood of the power station. Services were used up, and we lost considerable gas, and we were put not only to expense on that account but to the expense of replacing the services. There has also developed lately a little trouble in connection with one of our mains. But the Consolidated Railway are trying to improve the condition, and they are improving it. They have put in overhead return feeders; they have rebonded their rails; they are trying hard to do as little damage as possible. Whether that applies to the rest of New England I cannot say, but it would be very ungracious for me personally, while these men are doing whatever is reasonable, what I would say myself—and I think you gentlemen would say the same thing if you were in my place—is reasonable, to take any decided stand. They are gentlemen like ourselves. They are interested in their work. They want to do their work in the very best possible way, and they do not want to injure the property of other people. With those conditions isn't it better for us to go a little slowly, to let them work this matter out? It is comparatively a new thing. They are getting more familiar with it. They know that certain things done and certain remedies applied reduce the leaking electricity. It seems to me it would be wiser, judging by the local experience in Connecticut, for us to go slowly in this matter. While I am on my feet I would like to say that we have had a peculiar experience at the gas works at New Haven, and if you will consent I would like to have Mr. White, who is more familiar with the details than myself, give it.

The Vice-President—We shall be glad to hear from Mr. White.

Mr. White—This incident happened: Our governor house is not on a street where there is a trolley line; it is situated on a street at right angles to the streets on which the trolleys run, one line about 600 feet south of the governor house and one line about 1,000 feet north of it. A steam fitter noticed when making some alterations in the steam pipe that when he let a piece of pipe drop out of his hand, and it fell against a railing or a water pipe there was a spark. That was the first time we noticed any sign of electric current. He reported it and an investigation was made at once. Mr. Knudsen, the electrical expert, made the investigation. The speaker was with him at the time. Running from our governor house, and in the street in front of it, there is a 20-inch gas main, a 12-inch gas main, a 16-inch gas main, and a 24-inch gas main. These pipes are all, with the exception of just a few joints right outside the building, put together with cement. It was found that there was practically no current flowing on these pipes. There is a 6-inch water service running into the building, taken from a 12-inch water main in the street, and this water service was carrying current. When a connection was made with the volt meter or the ammeter it showed about 35 to 40 amperes of current flowing from the 6-inch water service to the large mains in the building, and from that on down through the works. We had one or two sleeve joints handy and we found there was practically no current passing around these sleeve joints on the gas mains. The water main joints are all made with lead. It seemed very conclusive that cement joints make very good non-conductors. The water main has a small amount of iron in comparison with the large amount of iron that there is in the gas mains. In order to prevent the current from doing any damage to the works, it was first thought advisable to bond the two pipes together, but that would simply cause a tendency for the current to flow from one to the other, and instead of that we decided to cut the water service and put in an insulating joint, using a sleeve, and instead of using lead for caulking to make a joint with white pine strips. In the past 4 years there have been 3 electrical surveys made over our entire system, the water and gas companies joining. There were a few instances where we noticed that there was some damage being done; very slight. The attention of the trolley company was called to this fact. A later survey showed that they had remedied it to some extent. At that time we placed in 7 different parts of the city test wires on our mains; that is stripping a length of pipe, tapping two holes 10 feet apart on the same length, running wires to the curb, so that we could attach a millivolt meter at any time and ascertain whether there was any flow on our mains or not. We have gone to these stations about once in 4 or

months since and there is no appreciable reading at all on the mili-volt meter, showing that the pipes are not carrying any current, while the water pipes we find are carrying more or less, just the amount I do not know. In one or two instances last spring we found the trolley tracks in bad condition due to broken bonds, and when a car passed we were getting from 25 to over 50 volts thrown on the gas mains, but a report of that was made to the trolley company and after their summer travel was through, after Labor Day, they immediately began to relay those lines, putting in a much heavier rail and a more perfect bond, so we assume the troubles have been overcome in that direction, although no specific tests have been made on those lines since.

Mr. Gardiner—I would like to ask Mr. White if, when he introduced the insulating joint in the water service, all current ceased flowing?

Mr. White—To answer that question perfectly straight, I don't know. Mr. Knudsen, who suggested that we put in one joint, said he thought it would be a perfect insulator, but if there was a slight current passing one joint to cut the pipe again and put in another, and that he was absolutely sure two joints would form a perfect insulator. No tests have been made since then, so that I do not know. I might say that the water company use entirely lead joints on their mains.

Mr. Barnum—I should like to ask Mr. White if the water will not conduct the electricity around that insulated joint. I did not understand that it was possible to make the water pipe a non-conductor, in the case of ordinary city water.

Mr. White—Mr. Knudsen, the electrical expert who recommended this method told me he actually had tried that in another place and had found that no current passed the two joints; I believe a very slight current did pass the one insulated joint, but no current passed the two joints. I think that place was somewhere in New England.

Mr. Nettleton—Mr. White believes that we have made no test on this water pipe. I am very confident that the engineer of the gas works, Mr. Wyant, told me had made a test, and that the current was practically eliminated by that joint, but it was reduced to a point where it would take care of itself and do no harm.

Mr. Leonard—I understood Mr. White to say that the current was 40 amperes on that pipe. I would like to inquire what the voltage was.

Mr. White—I don't know that I can give you close figures, but if my memory serves me right the voltage was quite low, I think not over 3 or 4 volts. The number of amperes was obtained direct from an ammeter.

Mr. Leonard—I would like to inquire if a difference in the amount of current and voltage makes a difference in the rapidity with which the metal follows the current; that is to say, if it makes a difference in the rapidity with which electrolysis takes place. For instance, suppose you had an amperage of 10 amperes and a high voltage, would it cause a more rapid disintegration than if it was the other way, a low voltage and a high amperage?

Mr. White—I cannot answer that question.

The Vice-President—Possibly Mr. Prichard, having made considerable research on all those lines, and being able to answer every and all questions, might answer that question.

Mr. Prichard—I was about to say, Mr. President, that I did not want Mr. Witherby to get a wrong impression from the report. The report said that the reports received show no damage in many places. I cannot recall the places from which we had reports, perhaps exactly, but Worcester, Springfield, Providence, Fall River, Lowell, and quite a number of the large cities reported no damage. We got some reports where there was damage being done. One was from Lawrence, and Mr. Sargent has brought in some samples this morning of service pipes to show the effect of electrolysis. Another was from New Bedford, which Mr. Stetson can tell you about, which was of a local character. Boston, of course, has a lot of them. I believe these were about all reported to the committee. That is the reason we drew up our report as we did. I wanted to say, in answer to Mr. Barnum's question, that pure water, such as is distributed in New Haven, is an extremely poor conductor, and they would be practically insulated there with it. If that water had been a little salt he would have got it all right. Apparently the explanation of the cause of the trouble at New Haven in a way may be compared with that which took place at North Adams. I omitted to say we had a report from there of the bad work done. In North Adams they had long stretches of pipe and gathered up current which had considerable voltage. Probably in Mr. Nettleton's case the voltage was insufficient to jump around an insulated joint. If it had been of a higher voltage the putting in of 1 or 2 insulated joints would have made a bad matter much worse, unless they had taken that current and had carried it to the salt water or to some good conductor back of the power station.

Mr. Cathels—A question I would like to ask is whether the current entering the pipe is as disastrous as when it leaves the pipe. I would also like to ask what is the minimum amount of current that is considered dangerous when it leaves the pipe?

The Vice-President—I think Mr. Prichard answered in his report the first question. We would like to hear from Mr. Prichard, though, on both those points.

Mr. Prichard—If the pipes become carriers of current to any extent, and at some point in their length there is offered a better path for a portion of the current to flow through, it will leave the gas pipe and in leaving will take with it a portion of the iron and we have electrolysis. There is no action, of course, when the current gets on to the pipe; it is only when the current leaves the pipe to jump to some metallic connection or to pass through salty, wet soil or some good conductor.

Mr. Witherby—Replying directly to Mr. Cathel's question, the destruction of pipes by electrolysis is exactly the same as electro-plating. The pipe, when it is the negative end, when it receives the current, sustains absolutely no damage at all, but where the pipe is positive to the rails, and where the current leaves the pipe for the rails or any other better conductor, that is where all the damage takes place. I have in mind a specific instance where an inch service pipe that had been in use for a number of years, and had always given perfect satisfaction and no trouble, within the next 60 days after a change of the location of the power house of the street railway company, produced a large leakage of gas. It brought our attention to the location and we found the service pipes gone entirely. People do not realize—that is, our local people did not realize—perhaps what all the conditions were leading up to it. A new service pipe was put in. That went out in less than 30 days. They thought they would fix it for sure the next time, and put in a galvanized pipe. That lasted about 10 days longer. A lead pipe was put in which went quicker than the others. Then we went after the railroad company, and found very serious conditions there. I feel sure that there is not 10 per cent. of our members here who really realize at the present time just what we are up against. Now, I have the greatest regard for Mr. Nettleton, and I hate to take issue with him on this question. He says in the way of advice to keep quiet for a while. I think we have been keeping quiet altogether too long. If Mr. Nettleton is fortunate enough in having trolley companies in his section that are promising to be good, and are really trying to avoid it, he is lucky; but some of the rest of us are not so fortunate. I know we have companies that are located where the trolley companies are run to show earnings irrespective of anything else, and, as the manager of one of them said to me, "What difference does it make to me how our current gets back to the power house?" He was shown the question of economics that were bound to accrue to his own interest by proper bonding, proper taking care of it, but it was a matter of indifference to him. He stated, "Why, it will cost me $100,000 to put in the return feeders and bonds you recommend as being necessary, and I am not going to do that. I don't care whether it destroys the gas or the water pipes, or anybody else's pipes, as long as I operate on as low a per cent. as possible." Unfortunately for us, that is the way about three-quarters of the managers of the trolley companies look at it. It is a matter of indifference to them how much destruction is caused to the gas or water companies' mains. That is one of the great reasons why I think it is time we should take decided action. Another thing that should be touched upon at this time is the fact that a great many of us are connecting up remote sections or re-enforcing older distribution systems with high pressure lines. These high pressure lines in a great many cases have been made of wrought iron pipe, and wherever a wrought iron pipe is used with continuous screw joints there is bound to be trouble if you have any particle of electrolysis at all. It may come this year or it may come next, but when it does come you are going to hear from it and somebody has got to pay for it. If high pressure lines could be made of cast iron pipe at all times it would help matters. I don't want to advertise any particular make or brand of goods, but this new Universal pipe that has been brought out, which we have used a great deal of, that goes together set as a ground joint, serves the purpose better than anything else, from the fact that the carrying capacity or the conductivity of the joint is equal; in fact, from tests that have been made, is a little bit more than the cross section area of the balance of the pipe. If the survey is made carefully, when this installation is made it of course will take up more current than a pipe with a poorly insulated joint. But there is this satisfaction: The pipe when it once gets the current will carry it to the end, and it is only to find out just where the current leaves to at that point make proper and necessary bonding, so that it will leave through the path of least resistance. In that way there is absolutely no damage to the pipe. That

means quite an investigation, covering a long period of time, and is going to take careful surveying and testing, but if it is done in that way it comes nearer being the ideal condition than anything else. As to putting in insulating joints in wrought or cast iron pipe, I think you are simply distributing your troubles. Instead of having it at some one point where you can take care of it you are putting it on a little bit all along the line, and when the time comes, whether it is this year or next, you will have to relay the whole thing. I know one suburban company now that connects up a large number of towns that must renew practically its entire trunk line distribution system this coming season, and it is a matter of a good many thousand dollars. Now I say it is time that the Association puts itself on record.

The Vice-President—It is those differences of opinion among men that make discussions more interesting. There are a good many points brought out explaining why Mr. Witherby does not agree with Mr. Nettleton. That is just why we are here to determine. Is there any gentleman who wishes to continue further this discussion?

Mr. White—I would refer the members to a recent issue of "Fire and Water," giving 2 or 3 pages on this subject that may be of some value. The writer's opinion is contrary to many of the questions of the insulation of the pipe.

Mr. Prichard—Just one little point I would like to clear up, because some one may follow Mr. Witherby's thought and attempt to take back the electric current by the underground pipe if the railroad is poorly bonded. I cannot give you figures, but you will find them readily if you look them up in some book like "Brownell," and you will be surprised to find how large a pipe it will take to carry back to the power station an extremely small current. I think in one case where the gentleman figured it out it took something like a 48-inch pipe of the usual weight and thickness to take back a current that the trolley road was not properly caring for. So that if you put in a section of pipe with solid joints you may carry it several hundred feet, and then you will have it jump to some other or better conductor, and you will get your damage at that point. The only way to stop it travelling on your pipe at all is to put in an insulated joint very, very frequently, as I said in the report about every joint, because if you have 25 volts flowing along your pipe and you put in one insulating joint 25 volts will jump a big joint. If, however, you have it divided into 25 or 30 joints 1 volt won't jump much of a joint, and you won't get any electrolysis.

Mr. Witherby—Coming right back to what I stated when I was on the floor first in reference to this matter, if it is in dry, sandy soil an insulated joint would effectually preclude any electrolysis at all. If it is in a wet, marshy, clay soil, I don't care how many insulating joints you put in, it simply distributes your troubles.

Mr. Prichard—Well, I want simply to put myself on record as saying that I don't think that theory is correct. A current of sufficient voltage will jump any reasonably thick insulated joint.

The President—I don't think it will settle it, but I can give you the actual result in practice. No insulating joint will stop electrolysis in damp soil or in soil of the proper chemical condition that will allow this action to take place. With that same length of pipe in dry soil, or high land and dry sandy soil, you don't need any insulating joint. The only way to do it is to use a ipe, in my opinion, entirely free of insulating joints, and then connect to the return trolley, and take it off, preferably opposite the power house, and into their switchboard. Beside that, it is proven necessary for the safety of the gas pipes to connect with the water system. In Adams it has been connected with the water system. At our central station the water pipes, and the gas and steam pipes and everything else, have all been connected in together. Every insulating joint, every special, every drip, has been bonded with a strip copper bond. We had a machine to burr the pipe and get it perfectly clear. We had a double acting torch, and the bonds all were securely soldered at each end. In addition to that to make the connection absolutely solid, there was a clamp put upon each side of the fitting, bonded. We have 13 miles of absolutely straight conductor, and it is carrying a large amount of current back to the trolley power house. Our greatest trouble was in a section of 1,100 or 1,200 feet opposite the power hause. The pipe lay in very damp, mucky, soft soil, ideal conditions for destructive action of electrolysis, and there it would always be quickly destroyed. We took out 700 feet and renewed it. The carrying capacity of the bonds was something over 400,000 c.m. It is a sad condition and is a serious danger. It is something that this Association, in my opinion, and every organization of a like nature, ought to place themselves fairly and squarely on record as to what they believe to be equitable, just and right. The trolley people have no right to let current leak and ruin or harm anyone. How long would we do business if we allowed a leaking pipe to run across a street enter a block, or any building, and say to the owner, "What do we care about that? We are on a low per cent. of operation, and care nothing how you are affected." That is the very same relative position. It is a wrong attitude. The principle is unjust. We have a hard proposition, for trolley managers on this question have banded together, and are determined, in my opinion, to protect individual cases where action is taken. But I firmly believe that a case taken to court would have good standing, before Massachusetts courts in any event. Suburban territory cannot be developed with any safety, existing low pressure systems cannot be strengthened by running a belt line, because you are bound to parallel trolley lines, without this very danger being present all the time. If one could always lay pipe in sand that is high and dry the proposition would be simplified. On every service we have put an insulating coupling for safety to the building. We might keep on doing that, but that does not remedy the fault. The trolley people should themselves offer to remedy the difficulty by adopting proper and safe methods. They should be compelled to lay a return conduit, or a return wire, or in some way to keep the current upon their own equipment and clear of other property. They have the room and the means. There are appliances that can be had. I should favor a resolution, or an action. It would do a great deal of good.

Mr. McQueston—Concerning Mr. Witherby's remarks. Assuming you have a gas main running parallel with an electric trolley road. You bond your pipe thoroughly the whole distance and make a good conductor of your gas main. It is connected to the trolley system by a good bond wire. The flow of current through the gas main depends on the potential difference between the points where connection is made with the trolley system. The better conductor you make your gas main, the more you take from the rail, the more current you are going to carry. If a break should occur in the return system of the road, between the points that the gas main acts as a conductor, and connection between the trolley and track is made through cars beyond the break, and you should open your gas main, a potential difference would still exist between the ends of your main where it is cut. Are you not likely to get into trouble through an explosion. Is it not dangerous to do so?

Mr. Witherby—If that is a direct question I should say yes, providing such a peculiar condition could happen; but as conditions are possible, and if just those things should happen under those conditions, no doubt there would be. In fact, some gas companies have taken the question so far now that they have issued positive and direct instructions to their service repair men and main layers that under no condition is any work to be done, or are any ends of pipes to be disturbed, until they have first bonded up the ends of the work that they are going to start in on. In other words, run a bond of copper wire of sufficient carrying capacity around the source of trouble. It is a wise precaution.

Mr. Wood—The discussion has developed the fact that there are trolley companies and trolley companies, and I would like to speak a good word for the railway people. They have been more than willing to co-operate with us in remedying trouble, and have sent us a written request that we notify them wherever signs of electrolysis are found; and we do so. They send a representative who checks our test. We are accumulating a lot of information with the idea that some day it may be useful should the question be brought to trial, but with us the railway does not take the position that Mr. Witherby indicates. I am sorry for Mr. Witherby. There is one more word I want to say about the report. Mr. Witherby misunderstood it and I did. It gave me the impression that the first statement was there was very little damage in the territory covered by our Association. Now it seems to me, if the report is to be adopted, that should be made clear. It would be interesting to know just how many companies did reply, and what percentage said that there was no damage.

The Vice-President—Mr. Prichard, can you answer the question asked by Mr. Wood? Did you keep any record of the number of companies that replied to the inquiries?

Mr. Prichard—I think I have all the letters. I could not say how many, but a very large proportion, say three-fourths, reported no trouble. The others reported isolated cases, such as have been brought up here this morning.

The Vice-President—Several other questions are to be discussed. I don't want to shut off any debate on this one, because it is most important, but it strikes me the proper action to be taken by municipalities—owning water pipes—and gas companies their mains—is to compel the railroad companies to look after the current. They are responsible for the evil and damage, and they should be brought to task. I think possibly if the interested parties worked together the thing could be stopped. What action will you take with the report?

On motion of Mr. Morrison the report was accepted.

The President—We have but a few minutes more. Are there any questions upon the fourth page of this little pamphlet that any member wishes to have discussed? If so, it will facilitate the remaining minutes and assist the Association in getting advantage of some one person's needs. I will read this:

"Have any members used tar for enriching in a water gas set; and, if so, with what results?"

Has Boston done anything in that direction?

Mr. Wood—No, sir; we use oil.

The President—Mr. Nute?

Mr. Nute—Mr. President, we have no experience in that direction, although I know it has been experimented with to some considerable extent by the U. G. I. Company. Just exactly what results they have obtained I am not prepared to state.

The President—

"Should a gasholder out of use be up or grounded? Contain gas or air? Crown be open or closed? No heat to prevent freezing?"

Who will answer those questions, or try to? If the member who asked the questions is in the room, might it not provoke an answer if he would state the reasons for making the inquiry. Here is an additional question:

"Are there any gas companies that obtain permission from the owners of property to run a service pipe, or house piping, or piping to any gas appliance when the order for such work is given by the tenant? If permission is obtained from the owner, is it in writing? If permission is not obtained from the owner, has the gas company the right to do such work?"

Mr. Barnes—I would say that in Cambridge we make it a rule to get the signature of the owner of the property. If the owner is to pay for the service pipe and meter connections the bill is sent to him. It sometimes happens that the tenant is ready to pay for such, but even then we require in most cases that the owner shall be responsible for it, and in any case that he shall be willing that the service pipe and meter connections shall be put in, and willing in case any change is made in any of those pipes. We absolutely decline to do anything with the meter and service pipes in a man's house, except with the consent of the owner, believing that the safest way.

Mr. White—I would like to ask how that works out in practice. The legal end of it is one question, the practical end of it is another. We frequently have cases where a man comes in in the morning and says: "Why, I have just rented this house. I have to get out of the house that I am in. I don't own a coal stove. I own a gas range. Can't you supply me with gas? "If the owner of the house is in California, or at the shore or some other place, must we refuse to give that man gas? We have had a number of cases where a wedding took place in the morning and they wanted to move into the house the next day, or within a day or two, but there is no service. An owner is building a house. He leaves it to the architect, the architect leaves it to the plumber and the plumber leaves it to the gas company. When they get ready to move in they have no gas. They want it, and want it right away. It seems to me it would tie matters up in such a shape that a man actually could not do his work and get it done. On the other hand, if a canvasser is sent out to solicit business he goes to the tenant and secures an order for a stove. Is it put upon that canvasser to then secure the permission of the landlord before he can install the stove, and if the landlord refuses, go back and say to the tenant, "You cannot have a stove?" We think we would lose business in that way. Or, if we said to the tenant, "You secure the permission," the tenant would reply, "I want that stove right away; I want it to-morrow or next day, at least within a week. I paid the landlord his rent last week and he won't be around for a month. I don't know where he lives." We think these cases would come up, and that it would very much handicap us in our business. If anyone has had experience in working that out I would like to know the result.

The President—In view of the fact that an opportunity has been given for any question to be brought before the meeting now, even though it leaves some unanswered, and because it is 1 o'clock, unless there is something further to be given by the members I suggest that anyone who desires to answer a question that is unanswered, write the answer out and send it to the Secretary and it will be embodied in the report. Is there any other business to be brought before the meeting? Is there any other matter that is unfinished? Is there anything further that any member desires to say? Every bit of business that is provided for has been finished, I believe.

Vote of Thanks.

Mr. Nettleton—Mr. President, I would like to move a very hearty vote of thanks to the officers of the Association for what they have done to make this meeting a success. It seems to me that it is one of the most successful meetings we have ever had. Those things don't come of themselves. There is a lot of hard work back of it. I think that vote of thanks is due, and I am very glad to offer the motion.

The President—Will you put it, Mr. Nettleton?

Mr. Nettleton—Gentlemen, you have heard the motion. Is it seconded? [Seconded and adopted by rising vote.]

Adjournment.

The President—Mr. Nettleton and Members of the Association: I accept this for the other officers, and in a small way myself, and express our keen appreciation of this kindly and generous action. I endeavored in a feeble way to express my appreciation personally. Again I thank you very heartily, and wish you all God speed. The meeting is adjourned.

ROLL CALL

showed the presence of the following members, and guests:

Honorary.

J. H. Armington. Wm. H. Bradley.

Active.

Addicks, W. R.	Goodwin, F. A.	Nute, J. F.
Africa, W. G.	Gould, J. A.	Nutting, C. H.
Allen, B. J.	Gould, V. K.	Nutter, E. J.
Allyn, H. A.	Harbison, J. P.	Pease, A. C.
Barnum, D. D.	Havener, F. N.	Prichard, C. F.
Bill, B. P.	Hawken, T.	Prichard, C. R.
Bill, W. C.	Hintze, T. H.	Priest, G. H.
Brockington, F. T.	Humphreys, J. J., Jr.	Philbrick, J. E.
Cathels, E.	Jenks, L. M.	Quinn, A. K.
Campbell, A. J.	Jennings, F. W.	Richardson, F. S.
Cheney, H. N.	Johns, L. B.	Sargent, F. H.
Coffin, J. A.	Kelly, H. H.	Sharp, R. P.
Coggeshall, H. F.	Lamson, C. D.	Shelton, F. H.
Cooper, A. F.	Lawson, W. H.	Slade, R. E.
Corson, F. H.	Learned, W. A.	Snow, W. H.
Cowperthwaite, G. E.	Learned, C. A.	Spaulding, C. F.
Coyle, P.	Leonard, C. F.	Spaulding, C. S.
Crafts, H. C.	Mace, F. W.	Spear, J. Q. A.
Dickens, J.	Macmunn, G. F.	Spear, J. N.
Dolan, J. B.	Manchester, G. L.	Stone, A. F.
Dustin, G. K.	McClellan, J. M.	Tenney, A. B.
Eccles, A. D.	McGregor, Wm.	Thayer, F. S.
Ellis, J. W.	McKay, W. E.	Thayer, W. F.
Erhard, T.	McQueston, Wm. M.	Todd, J. R.
Fish, R. H.	Morrison, H. K.	Travis, F. M.
Fisher, H.	Nettleton, C. H.	Walker, W. L.
Fowler, S. J.	Norcross, J. A.	White, C. E.
Frost, C. T.	Norton, H. A.	Wing, J. F.
Gifford, C. H.	Norton, W. F.	Witherby, E. E.
Gifford, N. W.	Norton, P. T.	Wood, W. A.

Associate.

Barnes, A. M.	Fiske, J. T.	Potter, T. J.
Barnes, F. G. P.	Gardiner, Wm. H., Jr.	Scranton, G. H.
Baldwin, C. H.	Griswold, C. S.	Sloper, H. T.
Beardsley, A. P.	Higgins, A. A.	Stiness, G. A.
Browne, A. P.	Hinman, C. W.	Storer, E. J.
Burr, A. R.	Holmes, R. E.	Waldo, C. S.
Caldwell, G. A.	Kerr, J. B.	Waldo, J. A.
Chisholm, C. F.	Leavenworth, M.	Wardwell, Wm.
Coburn, C. M.	Mack, C. A.	Warr, Wm.
Crowther, A. W.	Motley, G. S.	White, H. E.
Davis, F. J.	Nichols, Wm. B.	Wilder, C. E.
Drake, Wm. L.	Norton, A. E.	Wood, G. B.
Dunbar, A.	Osborne, R.	Wrightington, E. N.
Farrington, A. N.	Piser, T. H.	

Guests.

Azoy, A. C. M.	Cruse, A. R.	Parker, G. W.
Brown, E. C.	Daly, D. R.	Pratt, E. G.
Carpenter, H. A.	Dickey, C. H.	Rice, H. L.
Cartwright, H. R.	Hart, J. S. de	Russell, D. R.
Collins, D. J.	Hayward, S. F.	Wharton, H.
Copley, J. C.	MacDonald, Wm.	Williamson, J.
Cowdery, E. G.	Mayers, J. A.	

[Abstract.—Concluded from Page 627.]

FIFTH ANNUAL MEETING, WISCONSIN GAS ASSOCIATION.

Held at the Hotel Pfister, Milwaukee, Wis., Feb. 14-15, 1906.

Second Day—Afternoon Session.

Finishing the Question Box.

The President—Question No. 32 is:

"In tapping services into the side of the main, is there any simple construction which will prevent the service from pulling out?"

Mr. McAdam—I do not know of any construction or arrangement, simple or otherwise, that will prevent a service from being pulled out

of the side of a main. There might be such a thing gotten up possibly, but it would be of no earthly use, for the reason that the thing rarely happens. I have been a victim of this business for 20 years and have never known a service to pull out of a main. The fault lies somewhere else. The only remedy is to lay your main right, then the service won't come out.

Mr. Wortendyke—We do not tap the mains on the side, but on the top, even when we have a drip from a house. Of course mains break sometimes.

The President—What has determined the tapping into the top of the main instead of the side?

Mr. Wortendyke—Because services are found pulled out of small 4-inch mains, breaking out where they were tapped into the sides, but if you go in from the top and put a strong tee, a tee and an ell, or two ells, it will stop that difficulty.

Mr. McAdam—I never had them pull out on account of their being tapped in the side of the main. The cause is something else.

The President—Can you state what that cause is?

Mr. McAdam—There are several causes. If the main is inclined at the shift something will break; but we do not find that the simple fact of tapping services into the side of the main causes them to break.

Mr. Wortendyke—Two weeks ago we had a 6-inch main broken where the service was tapped in the side, and if it had been tapped on the top with a little care the main would not have broken at that point.

The President—Question No. 33 is:

> "By laying all mains of wrought iron pipe and protecting them by boxing and tarring, would not the saving in leakage pay for the extra first cost?"

I will call on Mr. McAdam to answer that.

Mr. McAdam—No. From the way I look at it it would be ridiculous for anyone to think of boxing a main of 6, 10 or 12 inches, for the cost of boxing would almost equal the cost of the pipe itself.

The President—Question No 34:

> "In cities of 100,000 inhabitants or more, is it advisable to have one or more inspectors whose sole duty it is to inspect all work done on services and check the measurements of and material used?"

I will call on Mr. McAdam to answer that.

Mr. McAdam—From the figures here, referring to cities of 100,000 inhabitants, it appears to me this is a shot at Milwaukee. I do not think it would be advisable or practicable to appoint one or more inspectors for such a purpose. In the first place, if you do appoint such an inspector, he has to know more than any of your foremen do. Consequently he has to be paid a larger salary. In order to be endowed with authority to order any changes in any work done, he has to know more than the general foreman, and in all probability they would conflict once in a while, thus there would be no end of trouble. In Milwaukee some days we have as many as 20 ditches open at one time for services, not including those on new mains. Now it is almost impossible to get one or two inspectors to travel all over the city of Milwaukee, West Allis and Wauwatosa, to measure those services and examine them to see if the material is right. You would have to have the men, when the service was already laid, leave the trenches open until the inspector came around to look at the job. It is out of the question. I see no use for such an inspector. Of course, if you want to run a charitable institution in the street department it is all right, but I do not think that any of us are justified in having any such surplus labor, and the office in question would simply be so much deadwood.

The President—Question 35 is:

> "Has anyone had experience with the use of gray lime as an agent for extracting frost from the ground in the line of trenches; and, if so, please state the amount of lime used per cubic foot of earth, the efficiency of the method and the general conditions?"

I will call on Mr. Brown to answer that question.

Mr. Brown—I have had experience in that line, but not recently, and I could not give the figures. I think that we did not use anything else in Newark. It took about a bushel of unslaked lime to a foot of trench, that is for about 3 feet of frost; but when the frost gets to greater depth than that I do not believe lime is effective. We do not use it here at all except in occasional cases where we have very bad breaks and do not want to use fire.

The President—Question No. 36 is:

> "In laying cast iron mains, especially the larger sizes, is it advisable to use a transit level in the bottom of the trench as it is dug and lay the main on the bottom of the trench with bell holes dug out, or block the main with wood blocks, stone or filled with earth?"

Mr. Cornish's answer, as read by Mr. Haase, was as follows: I should recommend laying mains where the soil is good with as little blocking as possible. This would make it necessary to dig out the bell holes. On most of our streets the grade has been established by the city, and the men in digging the trenches are able to follow this grade very readily, measuring down from the surface. In cases where the grade has not been established it would certainly be advisable to use a level and give the men a grade to guide them. In this way a minimum amount of blocking could be used and the pipe could practically lie on the bottom of the trench. In some cases, where the ground is soft and marshy, it is necessary to use blocking to give the pipe greater bearing while the men are laying it.

The Wrinkles.

The President—We will now hear the report of the Committe on Wrinkles.

Editor Walker read the budget as follows:

Wrinkle No. 1 shows a siphon jet water heater for heating a holder tank. It is claimed that this will use only about one-half the steam and does not make any noise.

Wrinkle No. 2 shows a way of fixing a holder tank below the water line. Holder is situated on a river bank and high water washes dirt away from outside, and pressure on the inside cracks wall so that the holder water leaks out. Holder water went down to 12 feet; could not spare any more holder capacity, so had to fix crack under water. A box 30 inches wide by 4 inches deep and 14 feet long was put down, 8 feet of the length being under water and 6 feet out of it, so that there would be some chance above the water of holding it against the side of the wall. On the sides of this box, 2 small boxes were made, and after the large box was in place and screwed up as tightly as possible, the 2 small boxes were packed with cotton waste, so as to prevent leakage of cement.—J. P. Eastman.

Adjournment.

The President—I think the Question Box and Wrinkle Department Editors have performed their duties so well that with your consent I will continue them for another year. (Applause.) The time for adjournment has arrived, and I wish to express to the members of the Association my appreciation at your having been so regular in attendance. I think I can safely say that the percentage of attendance has been larger than at any other Association meeting I ever attended. I think we can congratulate ourselves as an Association that this year has been as good a year as we ever have enjoyed; that is, so far as our meeting is concerned, and that we have derived as much good from this meeting as from any of its predecessors. If there is no further business I declare the convention adjourned. [No dissent.]

[Official Report—Continued from Page 628.]

TWENTY-SECOND ANNUAL MEETING, OHIO GAS LIGHT ASSOCIATION.

Held in Cincinnati, O., March 21, 22 and 23, 1906.

First Day—Morning Session.

A motion to dispense with the reading of the minutes of the last meeting having been adopted, the President called for the

Report of the Executive Committee.

Gentlemen—Your Executive Committee begs leave to submit for your consideration the following recommendations and report:

Nominating Committee: Messrs. M. E. Malone, John D. McIlhenny, F. R. Persons.

Committee on Next Place of Meeting: Messrs. W. B. Tuttle, J. M. Robb, W. C. Hedges.

Committee on Final Resolutions: Messrs. H. B. Harrop, E. W. Stone, H. D. Harper.

That John Vandemoer, L. T. Palmer, F. C. Binkley, Louis F. Small, Robert S. Magee, Horace F. Clark, F. L. Allcott, Jul. Nicolaus, C. T. Mason, be released from membership at their own request.

That Q. S. Backus, E. S. Hoyt and Robert Watt be dropped from membership for non-payment of dues.

That the following be elected to membership:

Adams, B. C., Superintendent Distribution, Madison (Wis.) Gas and Electric Co.

Aue, Joseph, E., Mechanical Engineer, Snow Steam Pump Works, Buffalo, N. Y.

Barbour, George H., First Vice-President, The Michigan Stove Co., Detroit, Mich.

Bates, Frank H., Chicago Heights, Ills.

Beauchemm, J. H., Consulting Engineer and Manager, Sorel Gas Works, Sorel, P. Q., Canada.

Birbeck, W. D., Sales Dept., Kerr Murray Mfg. Co., Fort Wayne, Ind.

Brown, D. H., Foreman, Oklahoma Gas and Electric Co., Oklahoma City, O. T.

Brown, H. H., Superintendent, the Wonder Mfg. Co., Washington C. H., O.

Burcome, Norman S , Tacoma (Wash.) Gas and Electric Co.

Choate, R. R., Salesman, Madison (Wis.) Gas and Electric Co.

Crow, A. D., Cashier, Oberlin (O.) Gas and Electric Co.

Corbus, C. D., Manager, Welsbach Co., 429 Main st., Cincinnati, O.

Cressler, Kerr Murray, Assistant Engineer, Kerr Murray Mfg. Co., Fort Wayne, Ind.

Dutter, H. O., Works Supt., Peoples Gas and Electric Co., Defiance, O.

Frazer, D. H., Gen. Mgr., Battle Creek (Mich.) Gas Company.

Fischer, C. H., Chemist, Cincinnati (O.) Gas and Electric Co.

Flynn, Frank R., Cashier, Elkhart (Ind.) Gas Co.

Giddings, E. R., Commercial Agent, Elkhart (Ind.) Gas Co.

Gartland, C. C., Supt., Sioux City (Ia.) Gas and Electric Co.

Gill, J. H., Welsbach Street Lighting Company of America, Cincinnati, O.

Hulswit, Frank G., Grand Rapids, Mich.

Johnson, Albert H., Peoples Gas Light Co., Chicago, Ills.

Johnson, D. F., Manager, Elkhart (Ind.) Gas Co.

Jones, Fred, Manager, Barret Mfg. Co., Cincinnati, O.

Kane, William, President, Wm. Kane Mfg. Co., Philadelphia, Pa.

Long, H. J., Secretary, Monarch Water Heater Co., Allegheny, Pa.

Lush, Ernest H., Elkhart (Ind.) Gas Co.

McCamy, C. C., Atlanta (Ga.) Gas Light Co.

McChesney, Chas., Oberlin (O.) Gas and Electric Co.

Niccum, J. B., Supt. Gas Dept., Georgetown (Ky.) Gas Co.

Page, R. F., Toledo (O.) Gas, Electric and Heating Co.

Paul, C. H., Las Animas Light, Power and Mfg. Co., Trinidad, Col.

Raine, S. J., Cincinnati, O.

Reilly, J. A., Cincinnati, O.

Robison, C D., Nyack (N. Y.) Gas Co.

Roesch D., Turtle Creek, Pa.

Schaddelee, R,, Grand Rapids, Mich.

Scherck, L. H., Birmingham (Ala.) Railway, Light and Power Co.

Smith, L. P. C., Beloit, Wis.

Spear, H. H., Manager, Williamsport (Pa.) Gas Co.

Taylor, G. F., Treas. and Local Mgr., the Ross Supply Co., Greenville, O.

Upson, C. W., President, Mansfield (O.) Gas Light Co.

Weart, Spencer S., Canton, O.

Wrightington, Edgar N., Secretary and Manager Commercial Department, Boston (Mass.) Consolidated Gas Co.

On motion the Report of the Executive Committee was adopted

Election of New Members.

On motion of Mr. John D. McIlhenny, duly seconded and carried, the Secretary was directed to cast the ballot of the Association for the election of the applicants recommended by the Executive Committee, and the Secretary reported that the instruction had been carried out.

The President—Of course, it is understood that the gentlemen, whose applications have just been favorably acted upon, and who are now active members of the Ohio Gas Light Association, are each and all cordially invited to participate in these proceedings and to take part in the discussions which will follow. We will now listen to the

Reports of the Secretary and Treasurer,

which were submitted by Secretary-Treasurer Jones, and on motion of Mr. Paul Doty the same were ordered accepted and filed.

Words of Regret.

The Secretary—Gentlemen, we have some letters and telegrams of regret, but as a number of them are quite long, I will simply read the names of those who sent them: Messrs. N. W. Gifford, Secretary New England Association of Gas Engineers; Henry L. Doherty, F. H. Shelton, F. W. Stone, Alanson P. Lathrop, George Steinwedell, Alten S. Miller, A. C. Humphreys, William McGregor, J. Charles Andrews, J. M. Robb, Arthur G. Glasgow, W. A. Baehr, Walter R. Addicks and Samuel T. Bodine.

The President asked Vice-President Perkins to take the Chair, and President McDonald then read the following

INAUGURAL ADDRESS:

The year just passed has been full of events of interest to all gas association members. The last meeting of this Association instructed the Committee on the Next Place of Meeting to defer its report until after the meeting of the Western, with a view to arranging for a joint meeting. The enthusiasm with which this motion was carried by the unanimous vote of the members present left no doubt that the larger movement behind the motion (that is, the union of all gas associations) was heartily favored by the Ohio.

As President of the Ohio Association I sent a copy of this motion to President of the Western Gas Association, with an invitation to that Association to take such steps as would result in a joint meeting in 1906. The President of the Western did not seem to favor the idea, or at least treated it from a humorous standpoint, and it did not come before the membership of the Western. Nothing, therefore, came of it as far as the Western is concerned.

As soon as the meeting of the Western Association passed your Committee on Next Place of Meeting met, and decided that our meeting should take place at Cincinnati, and the present gathering is the result of that decision.

The matter of amalgamation of all the Associations was brought almost to the point of becoming a reality by the action of the American Association at its meeting in Milwaukee on October 18th, 1905. At that meeting the American Gas Light Association adopted a report from the committee which was appointed by the Gas Congress of St. Louis. This report has been published, and I will, therefore not reproduce it here.

The report provides for uniting the American, the Ohio, and the Western into one Association, to be called the American Gas Institute, and by its terms it becomes binding upon the American as soon as it is ratified by either the Western or the Ohio. I, therefore, recommend that this Association appoint a committee with powers identical with those of the committee recommended by the Gas Congress Committee, and with the committee appointed by the American Gas Light Association. That is, full powers to take part in the organization of an Association to be known as the American Gas Institute, and to this end to wind up the affairs and dissolve this Association; and that the Ohio Gas Light Association does instruct this committee to proceed to effect the organization of the proposed Gas Institute, and to take all steps necessary for the winding up and dissolution of this Association.

The fact that those of our members who represent the State of Ohio will probably desire to continue an organization which might profitably include those adjoining States which have no Associations of their own will make it necessary for this committee to consider carefully some rights and equities which will not enter into the dissolution of the other two Associations. I think, however, that the committee can be depended upon to do the thing which is just, as well as that which is wise; and I believe that it is not necessary to instruct it further than to give it plenary power and the general instruction to accomplish the end sought. I believe that, when this committee is appointed, with powers and instructions such as I have indicated, the union of all gas men into one organization will become an accomplished fact. I believe that it will inure greatly to the benefit of the industry, and of the individuals representing it, and I believe that the Ohio Association is justly entitled to a large share of the credit which is due to the successful carrying out of this most important move.

The Question Box and the several departments are each in unusually able hands, and these, with the various committees which are to report and the papers which are to be read, cover almost the whole gas field, both engineering and commercial. I think it is, therefore, better that the features which are frequently contained in the President's address should be left to be handled by the able specialists in whose departments they naturally fall. I will, however, allude to the published report of the operation of vertical retorts, at Dessau, in Germany. If these retorts continue to do all that is claimed for them, and do not develop mechanical or structural difficulties, they mark the most important improvement that has been made in the gas industry in many years, and I think it will profit any American gas engineer to examine this system closely before constructing any new installation for making coal gas, or even before undertaking the reconstruction of an old setting.

Much has been said during the year about the progress of the craze for municipal ownership. I believe that with American cities, organized as they are, municipal ownership would be a great mistake; but I do not believe it is the duty of gas men to oppose this idea to any greater extent than it is the duty of all good citizens to oppose it. If the public want our works, they will pay for them; and, apart from the protection afforded by law, the national sense of fair play in the American people is a sufficient guarantee that, if the works are taken and paid for, they will be paid for at a fair price. My opinion is, however, that the time when the American people will be willing to embark in the manufacture of gas, and will create the debts necessary to do so, and ratify those debts at popular elections, is as far off to-day as it ever was. Generally speaking, the gas companies have furnished year by year a better service at a lower price; and while some sort of regulation similar to that which has existed for years in Massachusetts may result as the outcome of the present agitation, I do not believe that there will result anything radical, or anything which will seriously injure those companies which are treating the public fairly, as I believe nearly all gas companies are.

As this is probably the last meeting of the Ohio Gas Light Association as it is now constituted, I believe I will be pardoned if I take this occasion to thank the members for the courtesy and kindness with which they have treated me personally during the 13 years in which I have been a member. I was neither born to a gas company, nor did I achieve one—I had one thrust upon me; and it is to the members of this Association, more than to any other source of information, that I owe the fact that I was able to learn those things necessary to the salvation of the Company in time to meet the various emergencies as they arose.

The papers which will be presented to this meeting are of unusual interest, the amount of business to be transacted is large, and I earnestly request that each member will do his part in making this meeting all that it should be.

On motion of Mr. McIlhenny the Address was referred to a committee of three to formulate a report on the same to be submitted later to the Association, and the Vice-President appointed the following as the committee:

Messrs. Irvin Butterworth, Edward H. Earnshaw and W. E. Steinwedell.

(To be Continued.)

The Ramsdell Alcohol Torch.

In a brochure issued by the Ramsdell Inverted Gas Lamp Company, of New York city, it is declared that an alcohol torch should always be used for safety in lighting the Ramsdell inverted gas lamps, and to prevent smoking the globes. The Company has designed one which embodies some new wrinkles which it thinks will be appreciated. It is adapted for wood alcohol, is fitted with an asbestos wick, is practically air tight and also highly ornamental, being entirely nickel plated, with a hardwood handle. The handle can be indefinitely extended by removing the plug *F* and screwing in one or more lengths, reinserting the plug for finish. In the cut *A* shows the cap for tube when not in use; *B*, the loop for hanging; *C*, the jaws for turning key; *D*, chain pull; *E*, watertight filling plug; *F*, plug to be removed for extension handles. The length as shown is 28 inches; extension handles, screw ends, 22 inches.

The Flywheel of the Gas Engine.

By "Mechanic."

When the flywheel of the engine is out of line, as indicated at *A*, Fig. 1, faulty speed and bad service result. If you will examine the bearing of the wheel you will find that either the shaft is sprung or the keys are made to bolster up one side of the hub, or that the rim of the wheel is untrue. In this special case we will assume that the shaft is true and the hub is thrown out of alignment.

An examination of the set screws, or the keys used for holding the hub to the shaft, will usually reveal uneven driving of the keys and irregular pressure of the points of the set screws. In one engine the shaft was too small for the bore of the wheel-hub, and pieces of metal were inserted to build up the bore. This resulted in an unevenly balanced wheel, causing the engine to run unsteadily and to give non-effective service. More often the flywheel is discovered out of line, due to the opening of the seam between the shoulders in the rim, as at *B*. Or perhaps the wheel is made untrue and out of balance because of a defective adjustment of the sections, as at *C C*, Fig. 3. It is a good plan to use a try-square; a steel one is best or a wooden one may be made and used, as in Fig. 4. Here we get the perfect alignment of the sections forming the wheel. Most wheels of gas engines are in 4 sections, unless they are of small size, in which case the solid wheel is used.

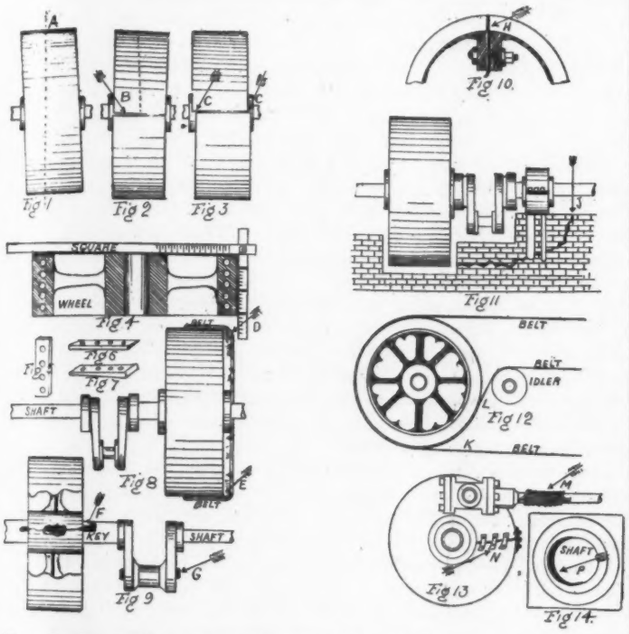
We find many large engines used, and the flywheels of these are often constructed in sections. Hence with the try-square you can get the true alignment of the sections. Then you need some pieces of metal, made wedge shape and in other form, on the lines illustrated in the next three figures. These are for the purpose of rectifying errors of form in the faces of the shoulders of the sections of the rims. Of course, it is a good plan to remove the incorrect section and file down any high part; but the same end is obtained by building up the low part with bevelled pieces of metal. A uniform piece is shown in Fig. 5, with holes bored to correspond to the holes in the shoulder of the section of the rim. Fig. 6 shows a bevelled piece and Fig. 7 a tapering or wedge shaped piece to use when pieces of this kind are needed. With the bolts loose, and with the try-square alongside the wheel, you can true up the sections, introduce the neccessary bolstering pieces of metal, and then tighten; but sometimes you are bothered with the gas engine because the driving belt does not remain on the flywheel. In some cases the flywheel is not only used for the purpose of effecting a balance to the engine but for carrying the driving belt. An untrue or poorly balanced flywheel will make the belt run over on the side and wobble. On the other hand, the belt may itself be out of condition, due to uneven lacing of the connection, or to the position of the receiving wheel. In Fig. 8 is shown one example of a belt running over on the side of the rim of the wheel, as at *D* and *E*.

The local machinists tinkered at the engine, but no remedy was found until the receiving or the driven wheel was attended to. This wheel was found to be 4 inches out of line. As it happened to be a crowned wheel the belt followed it, and, therefore, the belt was caused to run over on the side of the flywheel of the gas engine, as shown. Then, in another case the flywheel of a gas engine was found in a wabbly condition because of two defects. The chief one is shown at *F*, in Fig. 9, in which some one had driven a key of too large a size into the key-seat of the hub of the wheel, to the extent of breaking the hub. The hub just barely hung together so that the wheel could run. The wheel had to be taken off and a ring of iron shrunk on. At *G* was found that the crankshaft had been broken off at the arm, and in order to restore the part a stud, *G*, was inserted. The bore was not perfect so that at every turn of the engine the connecting rod jumped a little and jarred the engine. A new shaft was ordered and substituted. I noticed a number of flywheels turned by using soft lead between the joints, as at *H*, Fig. 10. Sheet lead forms quite an effective agent for this service, as the parts can be closed in securely upon the same. The soft material acts as a cushion for the surfaces, This is better than tin, pieces of leather, pasteboard and like stock which one is accustomed to see. It is a good plan to have some sheet lead on hand for this purpose. We must even go as far as the masonry foundation of the engine to locate certain faults of the unsteady wheel.

A short while since a high power gas engine developed a thumping sound and an irregular movement of the balance wheel at every turn of the wheel. The ignition system was overhauled, the electrodes were trued up and the various parts of the mechanism altered before anyone thought to investigate the foundation of the engine. Then a long, irregular crack in the brick foundation was observed as at *J*, Fig. 11. The fracture happened just where the bearings of the shaft of the flywheel were set, therefore the needed steady support for the journals was lacking. Some iron brackets were made and the journals temporarily supported until the masons could get to the brickwork and rectify the defect. Then in another shop where gas engine service was employed they complained of loss of power. Now there are many causes for loss of power. In this particular instance, the loss of power was very apparent. The flywheel of the engine carried the belt to the driven shaft some 10 feet away. This short distance made it necessary to run a tight belt; therefore, the belt extended almost direct across from wheel to wheel and the line *K* for the lower portion. Hence the belt contacted only with half of each wheel. The slipping occurred on the driver. This trouble was quickly overcome by putting an idler in, as shown. This made the contact of the belt on the driver extend to *L*, and no further slipping occurred. The belt had to be pieced out 8 inches

with a splice in order to allow for the leather necessary to go over the idler.

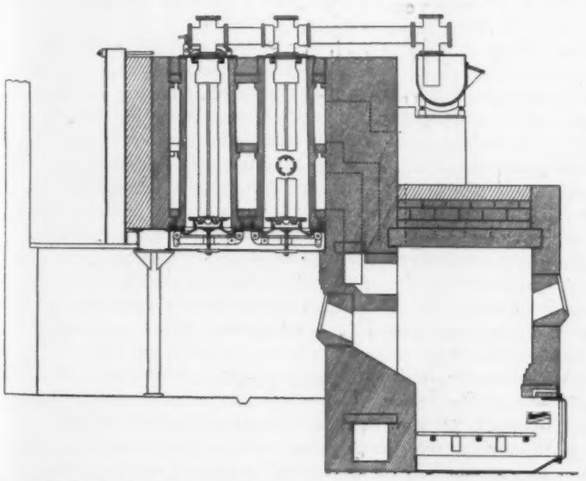
Fig. 13 shows the condition in which one solid wheel of a gas engine was found. In driving on the wheel some one used a sledge, and the wheel was cracked, as at *N*. This crack was patched with 3 pieces of metal strips riveted on; but it was a poorly executed job, and, together with the patched rod at *M*, very poor service resulted. The rod was sprung, and in trying to straighten it the wood splintered. Hence the binding with rope. Of course the wheel and the rope were removed and new ones put on, after which the engine ran as its builders intended it should. Our next find was the case of a binding shaft. Part of the bushing had worn to a flywheel shaft and some ingenious person filled out the worn place with a half-moon shaped piece of babbitt metal, as shown by the shaded portion at *P*, Fig. 14. This piece acted



like a brake on the shaft and caused the binding. A new bushing quickly rectified this botch piece of work.

The Parker Vertical Retort.

The form of vertical retort, shown in the accompanying drawing, is designed for use where the non-continuance system is employed. It may, however, be modified so as to be used in the continuous process.



The principal object of this device is to provide a central tube for taking off the gas generated in vertical retorts, the said tube to be of such form as to make the collection of the gas and the discharging of the coke practicable.

The idea of using the vertical form of retort with a central tube is not a new one, but it may be well to recite some of the advantages arising from its use.

The first of these is the providing of an escape for the gas, so that it will not remain in contact with the heated surface of the retort. This will mean an increase in the yield of gas and a higher candle power, as part, or possibly all, of the hydrocarbons, which ordinarily are broken down by overheating, and are deposited on the surface of the retorts in the form of carbon, will be preserved as illuminants.

Another advantage arising from the use of the central collecting tube is a reduction in the time required to carbonize a charge of coal. The heat, as applied to vertical retorts, must penetrate a deeper and deeper layer of material as it works towards the center of the charge. If this central core of coal in the retort can be done away with, the remaining portion can be burned off in a much shorter time, and the entire mass will be more equally carbonized.

The retorts, as laid out in the present design, measure 7 feet over all, with a top and bottom diameter of 1 foot, 9 inches, and 1 foot, 11 inches, respectively. The central tubes, which are of cast iron, having interior stiffening ribs, are 10 inches in diameter outside, and are made in three longitudinal sections. These sections are centered independently at the bottom, so as to leave space between for the gas to enter. They are hung from short collars at the top, these collars being secured in such a way as to be horizontally slidable, in order to be easily disengaged from the top mouthpieces when it becomes necessary to remove the collecting tubes for the purpose of cleaning or repairing.

The above dimensions will give the mass of coal to be carbonized a thickness of 6½ inches at the bottom and 5½ inches at the top of the retorts.

The combustion chamber is divided horizontally by tiles into 2 parts. The secondary air, which is preheated in the usual manner, is fed into the lower half of the combustion chamber, in such a way as to give a very long flame, thus deferring part of the combustion of the furnace gases until they reach the upper combustion chamber.

Before charging the retorts the coal will have to be put through a crusher, so one may figure 51 pounds of coal per cubic foot of retort capacity, or a charge of 600 pounds per retort. Whether or not this charge can be carbonized in 4 hours is a matter of conjecture, but in all probability it can be done.

The accompanying cut is from a plan as laid out for a bench of 6 retorts. The retorts would be charged and discharged in pairs, as there would only be 1 dip-pipe for each 2 retorts.

Fire and Fire Risks.

In his third lecture on the above subject before the Society of Arts delivered the last week in March, Professor Vivian B. Lewes devoted attention to the fire risks involved in the storage and transport of combustible materials. With regard to the spontaneous combustion of coal, he said that in coal stored in bulk in our gas works and elsewhere, or being carried in large consigments in vessels to distant ports, both absorption of oxygen and increase in temperature played an important part.

The Oxidation of Pyrites Theory.—It was still believed by many observers that it was the oxidation of pyrites in the coal itself which gave rise to its spontaneous ignition. The fact was, however, that many coals containing a high percentage of pyrites were perfectly safe, and had never been known to seriously heat or ignite, whilst other classes of coal practically free from pyrites invariably suffered from spontaneous ignition under conditions favorable for its production. A careful study of the phenomena occuring during the heating of a mass of coal lead to the conviction that the pyrites present could only play a very subsidiary part, and that it was, in reality, the absorption of oxygen by the freshly won coal and the activity of the condensed gas in contact with the hydrocarbons of the coal that were the active factors in causing the ignition. The mere absorption of oxygen, however, was insufficient to bring about serious consequences, unless there was an initial rise in temperature to start the action; and in coal cargo ships it was found in the enhanced air temperature whilst going through the tropics, in ships' bunkers by contact with the castings near the boilers, and in coal stores on shore by proximity to a steam pipe or flue. In every case it was found that the spontaneous ignition of the coal started at the point where the cause of the initial rise of temperature was to be found. The old idea as to the treatment of coal to prevent spontaneous ignition was to provide ventilation. This would be perfectly effective if a free flow of air through the mass of coal could be obtained, but this was impossible in a cargo aboard ship, and difficult even in a coal

store, the result generally being to supply just enough air to lead to dangerous heating. Moisture was a very powerful agent in aiding chemical action, and the action of the occluded oxygen in the coal was enormously aided by the presence of moisture, so that heavy rain whilst a cargo was being taken on board, or being stored generally, resulted in heating, and often in active danger.

An Extinctive Agent.—In order to prevent the spontaneous ignition of large masses of coal, the most important precaution to take was to prevent breakage as far as possible during storing, as the exposure of fresh surfaces of coal just at the time when it was being put under conditions in which the heat generated by the action of the oxygen could not escape was one of the chief factors that generally led to the danger. The breaking up of the coal which had taken place in the earlier stages of its career had probably had time to complete this action and get rid of the heat to the air, whilst in the store itself the greatest care must be exercised in order that no flue, drain, or steam pipe that could give rise to an increase in temperature, was anywhere near the store. Fourteen years ago he pointed out that, with a proper arrangement of apparatus, carbon dioxide could be made not only a most valuable extinctive agent, but also one of the most powerful cooling materials one could obtain. In applying this to coal cargoes he suggested that small cylinders of carbon dioxide fitted with a plug to fuse at 200° F., should be buried in the coal. One hundred cubic feet of gas could be condensed in the liquid state in a steel cylinder 1 foot long and 3 inches in diameter. A ton of coal contained air spaces equal to about 12 cubic feet, so that one of these cylinders would have to be put in for every 8 tons of coal. This proposition was, however, never taken up, partly because there was a fear that under the influence of heat the cylinders might explode. But if they were made in the same way as those used for the compressed hydrogen employed in military balloons were made, there would be no fear of a shattering explosion. The worst that would happen would be a ripping up of the cylinder along the weld of the seam, which would do no harm, but would be extremely efficacious in at once putting out the fire. Several firms had, however, adopted the idea both for the protection of coal cargoes and stores containing such goods as cotton, jute, or wool in bales, in which it would be extremely difficult to get at the fire by any other means. In most of these cases the cylinders were arranged externally to the store, and the gas only turned on when a fire was discovered.

The Western Coal Situation.

The Engineering and Mining Journal notes that the coal situation, now that both the anthracite and bituminous agreements have expired by their own limitations, remains altogether uncertain. No settlement has been reached, either in the East or the West, although the way has been opened for a partial arrangement in the Central bituminous district. Beyond this the future is still doubtful.

The Indianapolis conference broke up on March 31—it cannot be said without results, since an important outcome was the virtual abandonment of the interstate agreement, which has heretofore governed the operations of the mines in the Central competitive district, which covered the country from Central Pennsylvania to the Mississippi. On the part of the miners this was an abandonment of the original ground that no settlement would be made which did not cover the whole field. Doubtless it was due to the stand taken by the Pennsylvania operators, who had announced their willingness to compromise. The resolutions adopted by the union authorize the signature of an agreement in any district where the operators are willing to concede the wage scale of 1903, which involves an advance of 5.55 per cent. on the mining rates of the past two years.

Under these conditions the closing of agreements will depend in part on local considerations; but will also be determined in large part by the competitive situation. It is also the case that during the past year there have been many consolidations and combinations which have already changed materially the position of the coal trade in some of the Western States. The Indiana coal trade, for instance, and that of some of the Illinois districts, have come largely under the control of the railroad interests. Whether this movement has been for the best is a question that cannot be discussed here; but undoubtedly it results in the adoption of a different—perhaps a wider—view of the trade.

The Western Pennsylvania operators, with few exceptions, have already signed the district agreement, and most of the miners will be at work in a few days, only a temporary misunderstanding having prevented their continuous operation. The causes of this readiness are found in great part in the iron and steel situation. The larger companies in the Pittsburgh district are controlled by the steel companies, or have important contracts with them; and the steel makers cannot just now run the risks involved in a short supply of fuel. Moreover, the Pittsburgh men are too near the non-union mines of West Virginia, and there is still a recollection of the way in which the strike of 1897 brought the mines of that State into the competitive market—and brought them to stay. The insistence of the steel companies on a settlement was hardly necessary, though it was effectual.

The strongest opposition to a district settlement at present seems to be in Ohio, where the operators are more independent and where they have suffered more from the low prices due to excessive competition. Ohio, however, has suffered perhaps more than other districts from the growing importance of West Virginia. The prospects of further displacement of Hocking Valley and other Ohio coals in the Western and Lake markets by the New River and Pocahontas products will probably be a strong element in deciding the operators of the State to concede the settlement. We believe that they will do this after only a slight delay.

The Indiana operators seem determined to stand out; at least this is the official statement of their association, and perhaps the sentiment of many of the smaller operators, who have been doing a business which leaves only a small margin of profit. But it is no secret that there is division in the ranks. The large combinations recently formed and controlled, as we have said, by the railroads, do not want, and will hardly consent to, any long stoppage of production. If they come into the agreement and start up their mines, the smaller operators must follow or go out of business altogether—some of them permanently. The situation is a grave one for this class of mine owners, and few of them are in a position to fight.

In Illinois the outcome is more uncertain. The operators had hoped, not only to settle the wage scale, but to bring up some collateral questions, such as the run-of-mine basis and the shot firers' wages. In this they have been altogether disappointed and are correspondingly sore. The same commercial considerations which have been already referred to may prevail in this State also, but there is more uncertainty, and the possibility of longer delay and stoppage of mining.

In the Southwestern district the general agreement has been abrogated also, and district settlements are to be the order of the day. In most cases it looks as if these would be made, with more or less delay and friction, according to local conditions.

Upon the whole, therefore, it seems safe to predict that—barring unforseen difficulties—the stoppage of coal mining in the West will be of short duration; too short to affect business seriously. It is to be noted that the leaders of the union are insisting that agreements made now must be for 2 years only. This shows that they are not unmindful of the tactical advantages which will result from the fact that the next adjustment of mining scales will come in the year of a Presidential election.

Design of Hydroelectric Power Stations.

A paper dealing with the design of hydroelectric power stations and having particular reference to the influence of the load factor was read by Mr. D. B. Rushmore before a recent meeting of the American Institute of Electrical Engineers.

The author stated that hydroelectric installations naturally divide into somewhat clearly defined classes, depending upon conditions The western high head plant, with great fluctuations in stream flow and with long ditches and pipe lines, containing but few units and feeding into a high tension network, is under different conditions from a low-head, many-unit, single-plant installation delivering power over short distances or to a single point. Reliability of service is not of such great importance in irrigation pumping as it is in the lighting supply of a large town. This is not always recognized in the discussion of comparative advantages of small complications necessary to obtain reliability of service as compared with extreme simplicity and home-made switching apparatus. Conditions which have proved satisfactory in the West could not be considered for systems which are never allowed to be out of service.

The number of plants to the system and the distribution of plants on different watersheds materially affect conditions of design and operation. A single plant with all the power transmitted to one place represents the most severe conditions; many plants, widely separated, on different watersheds, with steam auxiliaries and widely distributed use of power, the most favorable so far as load conditions are concerned. The class of service has an important bearing on the system of control. Where conditions of contract do not severely penalize trouble, much simpler arrangements can be used than where it is demanded that no expense be spared to insure against interruptions.

Upon the exact definition of load factor there is a lack of agreement. In the paper it is designated as the ratio of the average output to the maximum output. For considerations of storage, the load factor of stream flow has a vital bearing on the amount and cost of development. The great problem of hydraulic development is to transform the stream flow to correspond to the load curve. The design of different elements is determined by various limits, some of which are but indirectly connected with the load factor. Water conductors should primarily be of sufficient capacity for the worst conditions—not always the case. The grade of ditches may vary from 40 feet per mile for small ones, to 10 feet or less per mile for large, the allowable velocity depending on the soil. Velocities should be sufficient to prevent the growth of vegetation in ditches, but not sufficient to cause erosion.

Velocities in flumes may range from 8 to 20 feet per second. Tunnels, when lined with concrete, may have a friction co-efficient of from 0.010 to 0.012. The complete cost may vary from $5 to $6 per cubic yard, or from $20 to $30 per lineal foot, for a 9-foot tunnel. The co-efficient of friction with rough rock walls will be from 0.030 to 0.035. For lined tunnels, 12.5 feet per second is given as a conservative velocity. Velocities much higher are in use in short lengths.

Velocities in pipe lines vary from 3 to 15 feet per second. Wooden pipes with low velocities are often used at the upper ends, but the greatest loss of head should occur at the bottom in the most expensive pipe. The thickness and factor of safety used increase with the head. For all high pressure work, riveted sheet steel pipe is now universally used.

The best type of wheel to be used depends upon the head, quantity of water, speed, and range of load. Turbine wheels are efficient through only a small range of load, and under high heads are not easily regulated. In general, with low heads, large quantities of water and a number of generators to the plant, turbines are used. For small quantities of water, high heads, variable head impulse wheels are employed.

For large development, the selection of reservoir sites and capacities requires special investigation. Often several main reservoirs check the river flow, and a regulating reservoir at the head of the pipe line gives constant ditch flow and carries the load temporarily in case of accident to the water supply. If great fluctuations in stream flow obtain, it is seldom possible, from a commercial standpoint, to store all the water. Where development exceeds minimum stream flow, there are only a few high head propositions where storage is not desirable; conversely, in many low head installations the cost of storage is prohibitive.

Wheels and generators demand careful study to decide the best capacities. The size of the generator is usually indicated by some conditions in the proposition. The loss of one unit should not cripple the service. The generators and wheels should operate at points of best efficiency. The generator and wheel combinations are limited, and speeds are fixed by number of wheels, type head and output. For one plant systems the number of generators is preferably not less than four nor more than eight. For multiple plant systems, one unit to the station is not uncommon.

The cost with value of efficiency in power plant designing is an important but not clearly understood subject. The rough approximation usually made is to compare the selling price of the increased output with the interest charge on the greater cost. Where the saving in energy can be sold, as is usually the case, a higher efficiency in water conductors means a greater output, and a higher capacity of installed apparatus with higher total cost, so that the investment charge for the gain in power is greater than usually considered. This is true of all parts of the chain of energy transformation. Water wheels can be made of the best efficiency by designing them for the special conditions, instead of using standard patterns, and by the employment of a high grade of material with careful finish. The life can be increased by use of expensive metal and by cleaning the water. Wheels probably differ in efficiency much more than electrical apparatus. Doubt simply implies difficulty in hydraulic testing and scarcity of reliable results.

With a limited water supply, storage of water determines the possible development. Variations in load occur by the hour, day, season and year. Auxiliary or regulating reservoirs at the head of the pipe line take care of daily peaks, keep an even load on the water conductors, and serve to carry the plant over temporary ditch trouble, also serving as sand boxes. The location of the pipe line often renders storage at this point impossible. In one case, a flume of large dimensions is used for peak storage. In another, the water supply to a flume several miles in length is cut off entirely and the total stream flow used for another station.

Main reservoirs are on the river and regulate its flow. If these are of sufficient size, the total run-off can be used. The Reclamation Service is at present doing a great work in water storage, in some cases over a term of years. Snow is a natural form of storage, well illustrated at Puyallup, where, with a great variation in rainfall, a nearly constant stream-flow is obtained. Forests, vegetation and the soil fill the function of reservoirs. Dams are built to catch the underground waters.

For suddenly varying loads, as in railway and hoisting work, a fly-wheel is used to provide for instantaneous peaks. Irrigation laws may forbid the storage of water on old ditches. Electrical storage, at the distributing points, bears to the electrical system the same relation that the regulating reservoir does to the hydraulic.

The capacity of a water-power installation can usually be largely increased by the use of steam auxiliary plants. A steam plant can supply the deficiencies of stream-flow, and can carry peaks in any season. It may act as a regulator with steam turbine floating on the lines, the hydraulic generators running under constant load; it may act as a reserve in case of breakdown on line; and may serve to furnish the wattless current for the system, allowing other machines to carry greater overloads. The turbine unit may be run idle part of the year as a synchronous condenser, or may float on the line as such for part of the day and deliver energy at other times. Contracts for supply of continuous power, with severe penalty clauses, may necessitate the installation of an auxiliary plant at the distributing end of the line. Such a plant is now being installed at San Francisco.

ITEMS OF INTEREST FROM VARIOUS LOCALITIES.

AT a recent meeting of the Directors in the Danvers (Mass.) Gas Light Company it was voted to put the gross selling rate at $2 per 1,000 cubic feet, prompt payment (within 15 days) to entitle the user to a rebate of 20 cents.

MR. N. L. HURST, of Philadelphia, Pa., has been engaged by the Mankato (Minn.) Gas and Electric Light Company to take charge of its new business department.

MR. GUY F. GREGG has been appointed Manager of the coke division of the business of the Milwaukee (Wis.) Gas Light Company. He succeeds Mr. W. A. Lewis, who has been elected Secretary of the Milwaukee Concrete and Supply Company.

THE following originally appeared in the New York *Sun's* column devoted to live topics about town: "I'm one who will be glad when May 1 comes around and the 80-cent gas rate lopes in," declared the gloomy Harlemite. "This is what happened in my house and is liable to happen again any old time. One night my wife cooked a chicken. She had all the burners of the oven going full blast. It was a lovely chicken, done to a turn. That night after dinner we went on a little visit to Passaic. We intended staying 2 weeks, but it was so fine we made it 3. When we got back my wife going into the kitchen found it rather warm, she thought. She looked at the stove. Some grease that had spilt also had a warm look. It was warm. When she examined the oven she gave a wild shriek of dismay, but her dismay was not so great as mine when I paid the gas bill. She had left the oven burning and it had burned 3 weeks, the livelong time we were gone."

"R. S. N.," writing from Houston, Tex , under date of the 6th inst., incloses the following: "A negotiation relating to the Beaumont (Tex.) Gas Company was consummated this week which practically places the property in new hands. The entire capital has been purchased by H. N. Morris, of Chicago, and the new owner will put about $100,000 into the Company as rapidly as it is needed in the work of extending the mains and otherwise improving the plant and the service. At a meeting of the Directors of the Company held on April 5, W. C. Tyrrell, Jr., succeeded W. C. Tyrrell as President. There will be no other changes in the Directorate or among the local officials and employees of the Company. Mr. Morris, who has now full control of the Company, makes his home at Chicago, and controls the gas and electric light plants at Texarkana, Shreveport, Little Rock and other places. Along with the new capital in the Company there have been material reductions in the price of gas to consumers. Work of extending the gas mains of the Company was begun on North street this week and will be pushed throughout the city until the gas plant is made one of the most modern and up-to-date in Texas."

MAJOR JOHN H. MECASLIN, for many years prominent in the management of the Atlanta (Ga.) Light Company, died at his home in that city the morning of the 2d inst. He was in his 81st year, having been born in Baltimore, October 25, 1825. He settled in Atlanta in 1852, and there his fame and fortune, which were considerable, were gained. He was one of the most esteemed of Atlanta's citizens.

MR. H. E. MORTON, has resigned from the actual managership of the Boone (Ia.) Gas Company to accept the position of Manager of the Fort Dodge (Ia.) Light and Power Company, the resignation to become effective May 1st. He does not relinquish entirely his connection with the Boone Company, for he still retains his financial interest therein—will also act as its Secretary and will continue as a Director thereof.

GOVERNOR PENNYPACKER, of Pennsylvania, has reappointed Mr. William M. Ramsey to the position of Inspector of Illuminating Gas and Gas Meters for Allegheny county, Pa. The position is for 3 years, and Mr. Ramsey has been "on the job" for 6 years. He is a most competent official.

THE Knoxville (Tenn.) Company has arranged for the construction of a 300,000 capacity holder. It is to have two lifts, and is to rest in a steel tank.

"THE plumbers, steam and gasfitters and the steam fitters' helpers unions, of the State of Washington, at a meeting held in Seattle some days ago, organized a State Association. About 220 delegates were in attendance, under the Chairmanship of Augustus Busch. The social features were varied and pleasing. I will send you on a word or two more about this, when the proper time comes.—A. L. W."

MR. W. J. PAYNE, President of the Newport News (Va.) Gas Company has announced that the selling rate hereafter shall rule at $1.40 per 1,000 cubic feet—a concession of 20 cents per 1,000.

AT the annual meeting of the Monroe (Wis.) Gas Company, the officers elected were: Directors, Thomas Rankin, J. H. Eaton, D. C. Williams, J. J. Busenbenz and J. A. Woodbury; President and Treasurer, D. C. Williams; Vice-President, J. H. Eaton; Secretary, J. J. Busenbenz. The Company proposes to make important main extensions.

MR. PATRICK MAGILL, foreman of the Rochester (N. Y.) gas plant for 41 years, died at his home in that city, March 31st. He was in his 88th year. He had been on the pension list since 1894.

MANAGER JOHN D. SHATTUCK, of the Suburban Gas Company, of Chester, Pa., recently published the following notice: "In accordance with the policy heretofore pursued by the Company, we are pleased to announce a reduction of 5 cents per 1,000 cubic feet in the price of gas, to take effect May 1, 1906, making the net price of gas $1.05 per 1,000 cubic feet. Many people on our mains, though they do not use any appreciable quantity of gas, have installed in their residences, or places of business, meters which have to be periodically read, tested and cared for, and regularly reported and recorded on our books. This accommodation for such customers involves on the Company an unprofitable investment, also labor and bookkeeping charges, without in return adding to the increase of business of the Company. To cover such cases a monthly ready-to-serve charge of 50 cents is made to customers who do not use that amount of gas in a month."

JOHN NELSON, 59 years old, the oldest employee of the Kansas City (Mo.) Gas Company, is dead. Mr. Nelson had been a resident of Kansas City for nearly 30 years, and during 12 years of that time was in the employ of the Gas Company. He was born near Montreal, Canada, and went to Wisconsin with his parents when 18 years of age. Later he moved to Iowa, and then to Eldorado, Kan. From there he came to Kansas City. He was first employed in the lumber business and afterwards became engaged in the grocery business in Kansas City, Kan. He established a grocery in that city shortly after, but failed in an effort to carry his customers through the panic of 1893. Mrs. Nevada Nelson, his widow, and five children survive.

MR. R. W. BENNETT, Superintendent of the Norwich (N.Y.) Gas and Electric Company, has resigned, the resignation to become effective May 1.

"A. F. T.," writing from Montreal, Canada, under date of the 5th inst., forwarded the following: "From present appearances Quebec will, in the near future, have an extended and much improved gas service. I have been informed by a gentleman, who is connected with the transaction, that a syndicate, composed of Quebec, Toronto and Montreal capitalists, has now control of the majority of the stock of the Quebec Gas Company. It is the intention of the syndicate to remodel the plant and to extend the service to all parts of the city. To make the changes contemplated will require an expenditure of about $150,000. Among the parties from outside the city, who are connected with the syndicate, are Mr. W. H. Pearson, Jr., of the Economical Gas Apparatus Company, and the Consumers Gas Company of Toronto, and Mr. J. C. Duffield, President of the London (Ontario) Gas Company. The last-named gentleman will direct the operations in connection with the proposed alterations and improvements. The members of the syndicate feel that, with the prosperous times that are now dawning on Quebec, the money they are about to spend on the gas plant of the city will be a good investment, besides supplying the citizens with a cheaper and improved gas service."

THE plant of the Winston-Salem (N. C.) Gas and Lighting Company, which has been in the hands of a receiver for some months, will be sold by order of the Superior Court, the 28th inst.

IT is said the New York Safety Car Heating and Lighting Company intends to construct a Pintsch plant at Louisville, Ky.

IT is proposed to build a gas plant at Seaford, Del. The Company is capitalized in $30,000.

A GAS plant is proposed for Massapequa, L. I.

WE are very pleased to report that Mr. W. T. Hinton, Manager of the Fayetteville (N. C.) Gas and Electric Company, is recovering from the injuries received in the fire that destroyed the Company's office and a business block in Fayetteville, Sunday, March 24th. Mr. J. M. Cox is attending to the work in Mr. Hinton's absence.

THE Johnson-Reynolds Company, of Anderson, Ind., informs us that it has received an order from the Cincinnati (O.) Gas and Electric Company for 21 governors, ranging in sizes from 8 to 16 inches—11 of them being 12-inch governors. These are to reduce the pressure from the Cincinnati Company's high pressure line to ordinary street-main pressure, and will be installed in manholes throughout the city.

THE Kaukana (Wis.) Gas, Electric Light and Power Company has been incorporated with a capital stock of $100,000. The Company now operates the electric lighting supply of the town, and it is proposed to build a gas plant. The incorporators are Messrs. Wm. W. Allis, Charles S. Carter and Charles E. Canright.

Mr. FRANKLIN D. R. FURMAN, M.E., Editor of the "Morton Memorial Volume," which is really a history of the Stevens Institute of Technology, has sent us the following letter which explains itself:

"The Alumni Association of the Stevens Institute of Technology has recently issued a book as a memorial to our late President Morton. Its production was based entirely on the advance subscriptions of our Alumni and, being a costly book, only a limited number of copies were printed. We should like to have the copies that are now left over go to our friends outside of the Alumni, and I am, therefore, sending this letter to a number of universities and colleges, and to the technical societies, offering the opportunity to subscribe if they so desire, before sending review copies to the technical press. The price of the book is $10, delivery charges prepaid. We have less than 100 copies for sale. The book contains over 600 pages with much subject matter as given on the accompanying sheet. There are over 400 portraits and nearly 200 general illustrations. The book is bound in half morocco, gilt edges, and is printed on Dill and Collins best book paper."

THE employees of the Cambridge (Mass.) Gas Light Company have formed a Sick-Benefit Association, which embraces within its membership a great majority of the employees. The officers are: President, Robert Laws; Vice-President, John Brennan; Treasurer, Patrick Donahue; Recording Secretary, John Crowley; Financial Secretary, Mark Flood.

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NOTIFICATION RESPECTING ADVERTISING.

Orders for new advertising, or for changes in standing advertisements, to insure attention in the issue following their reception, must be in hand any time of Wednesday.

AGENTS:

New York—American News Co., 39 and 41 Chambers St.
Germany—Lemcke & Buechner, of New York.
England—Aug. Sieg, 30 Lime Street, London.

MONDAY, APRIL 16, 1906.

The Market for Gas Securities.

Continued depression rules in Consolidated gas, which closed to-day at 140½, after having sold as low as 138⅜—Friday. The ending was 140 bid, 140½ asked. Many old-time owners have sold out, but the stock has mainly gone into strong hands, or into those of persons closely identified with the Company's ownership and management. Brooklyn Union shows no change from the figures of last week.

Peoples, of Chicago, is 94⅝ bid, and the dealings in it are very small. Buffalo (N. Y.) gas is manifesting some activity, selling to-day at 9½. Lacledes are steady at ⅛ to ¼. Washington gas maintains its strength.

Gas Stocks.

Quotations by George W. Close, Broker and Dealer in Gas Stocks.
16 WALL STREET, NEW YORK CITY.

APRIL 16.

☞ All communications will receive particular attention.

☞ The following quotations are based on the par value of $100 per share.

N. Y. City Companies.	*Capital.*	*Par.*	*Bid.*	*Asked.*
Consolidated	$78,177,000	100	139¾	140
Central Union, Bonds, 5's	3,000,000	1,000	108	110
Equitable Bonds, 6's	1,000,000	1,000	..	105
" 1st Con. 5's	2,300,000	1 000	118	120
Mutual	3,500,000	100	255	270
Municipal Bonds	750,000	..	..	..
New Amsterdam Gas Co.—				
Bonds, 5's	11,000,000	1,000	105	107
New York & Richmond Gas Co. (Staten Island)	1,500,000	100	37	43
1st Mtg. Gold Bds. 5 p. ct.	1,000,000	..	98	104
Northern Union, Bonds, 5's	1,250,000	1,000	105	107
New York and East River Bonds 1st 5's	3,500,000	1,000	109	111
" 1st Con. 5's	1,500,000	..	104	110
Standard	5,000,000	100	140	160
Preferred	5,000,000	100	155	175
Bonds, 1st Mortgage, 5's	1,500,000	1,000	111	114
Yonkers	299,650	500	130	..
Out-of-Town Companies.				
Brooklyn Union	15,000,000	100	127	130
" " Bonds (5's)	15 000,000	1,000	112	113
Bay State	50,000,000	50	5/	¾
" Income Bonds	2,000,000	1,000	..	75
Binghamton Gas Works	450,000	100	..	65
" 1st Mtg. 5's	509,000	1,000	95	100
Boston United Gas Co.—				
1st Series S. F. Trust	7,000,000	1,000	82	85
d " " "	3,000.000	1.000	47½	50
Buffalo City Gas Co.	5,500,000	100	9	10
" " Bonds, 5's	5,250,000	1,000	75	80
Capital, Sacramento	500,000	50	..	35
Bonds (6's)	150,000	1,000	..	..
Chicago Gas Co. Guaranteed Gold Bonds	7,650,000	1,000	104	106¾
Cincinnati Gas and Electric Co.	29,500,000	100	105¼	105½
Columbus (O.) Gas Co., 1st Mortgage Bonds	1,500,000	1,000	90	..
Columbus (O.) Gas Lt. & Heating Co	1,682,750	100	..	95
Preferred	3,096,500	100	107½	108
Consumers, Toronto	,000,000	50	200	204
Consolidated, Baltimore	11,000,000	100	85¼	86½
Mortgage, 6's	3,500,000	..	..	118
Chesapeake, 1st 6's	1,000,000	..	..	..
Equitable, 1st 6's	910,000	..	..	..
Consolidated, 1st 5's	1,490 000	..	..	112
Consolidated Gas Co. of N. J.	1,000,000	100	15	17
" Con. Mtg. 5's	880,000	1,000	92	95
Bonds	75,000	..	..	100
Detroit City Gas Co	5,000,000	50	..	50
" Prior Lien 5's	4,618,000	1,000	..	98
Detroit Gas Co., 5's	381,000	1,000	75	80
" Inc. 5's	16,000	100	98½	100
Equitable Gas & Fuel Co., Chicago, Bonds	2,000,000	1,000	..	101
Essex and Hudson Gas Co.	5,500,000	..	39	40
Fort Wayne	2,000,000	..	..	..
" Bonds	2,000,000	..	55	..
Grand Rapids Gas Lt. Co. 1st Mtg. 5's	1,225,000	1,000	104½	105
Hartford	750,000	25	190	200
Hudson County Gas Co., of New Jersey	10,500,000	..	110	112
" Bonds, 5's	10,500,000	..	107½	108½
Indianapolis	2,000,000	..	60	70
" Bonds, 5's	2,650,000	..	104½	105
Jackson Gas Co	250,000	50	82	..
" 1st Mtg. 5's	290,000	1,000	97	100
Kansas City Gas Light Co., of Missouri	5,000,000	100	..	88
Bonds, 1st 5's	3,822,000	1,000	102	104
Laclede, St. Louis	10,000,000	100		105
Preferred	2,500,000	100	95	110
Bonds	10,000,000	1,000	108¼	109
Lafayette Gas Co., Ind.	1,000,000	100	..	60
Bonds	1,000,000	1,000	60	65
Louisville	2,570,000	50	143	145
Madison Gas & Elec. Co. " 1st Mtg. 6's	350,000	1,000	106	108¾
" 6 per cent. scrip, due 1910	100,000	25	85	87
Montreal, Canada	2,000,000	100	218	218¾
Nashville Gas Lt. Co.	1,000,000	100	110	..
Newark, N. J., Con. Gas Co.	6,000,000	..	56	58
Bonds, 6's	6,000,000	..	137	138
New Haven	2,000,000	25	200	..
Peoples G. L. & Coke Co. of Chicago	25,000,000	100	94⅝	94⅞
Peoples Gas Lt. & Coke Co., Chicago, 1st Mortgage	20,100,000	1,000	..	..
2d "	2,500,000	1,000	104	..
Rochester Gas & Elec. Co.	2,150,000	50	82	..
Preferred	2,150,000	50	116	..
Consolidated 5's	2,000,000	..	104½	105¼
San Francisco, Cal.	15,800,000	00	58½	58¾
St. Joseph Gas Co. " 1st Mtg. 5's	751,000	1,000	92	..
St. Paul Gas Light Co.	1,500,000	100	45	47
1st Mortgage 6's	650,000	1,000	113	116
Extension, 6's	600,000	1,000	112¾	116
General Mortgage, 5's	2,465,000	1,000	96¼	..
Syracuse, N. Y.	1,975,000	100	50	55
Bonds	2,047 000	1,000	102	..
Washington, D. C	2,600,000	20	305	305½
First mortgage 6's	600,000	..	..	..
Western, Milwaukee	4,000,000	..	..	..
Wilmington, Del	600,000	50	230	..

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SPECIAL NOTICE.

OFFICE OF THE UNITED GAS IMPROVEMENT CO.,
N. W. CORNER BROAD AND ARCH STS.,
PHILADELPHIA, February 14, 1906.

The Annual Meeting of the Stockholders of The United Gas Improvement Company will be held at the office of the Company, Northwest Corner of BROAD AND ARCH STREETS, PHILADELPHIA, on Monday, May 7, 1906, at 12 o'clock, noon, for the purpose of electing a President and six Directors, to serve for the ensuing year, considering and acting upon the subject of a proposed increase in the capital stock of the company from 7-4,500 shares of the par value of $50 each, to 918,005 shares of the par value of $50 each, and transacting such other business as may properly come before the meeting. The stock transfer books will be closed from 3 P.M., April 25, until 9 A.M., May 8th, 1906.

By order of the Board of Directors.

1603-3 W. F. DOUTHIRT, Secretary.

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Address, "C. C.,"

1609-2 Care this Journal.

WANTED,

Position as Manager of a Gas or Gas and Electrical Plant.

Medium sized works preferred. Recommendations as to ability. Address, "J. W. D.,"

1610-3 Care this Journal.

Position Wanted

As Superintendent of a Gas Plant,

By young man who thoroughly understands the manufacture of coal and water gas. Am married, and can furnish excellent references.

Address, "RESULTS,"

1610-1 Care this Journal.

Position Wanted

By young man with some small gas company as fitter, meter reader and all-around man. Can do collecting and work up new business. With present company four years. References if required.

Address, "N. O. S.,"

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WANTED.

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In a city in Northern Illinois of 18,000 people, working foreman for coal gas plant. One who understands the manufacture of coal gas in all departments and can handle men and get results. Must be sober and attend to business. Good wages will be paid for the right man. State age and where working.

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Man to Take Charge of Mechanical Department of Gas Company.

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1610-1 208 Fifth Avenue, New York City.

WANTED,

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1603-tf "S. H. W.," care this Journal.

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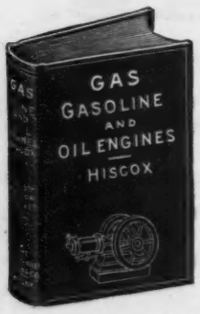

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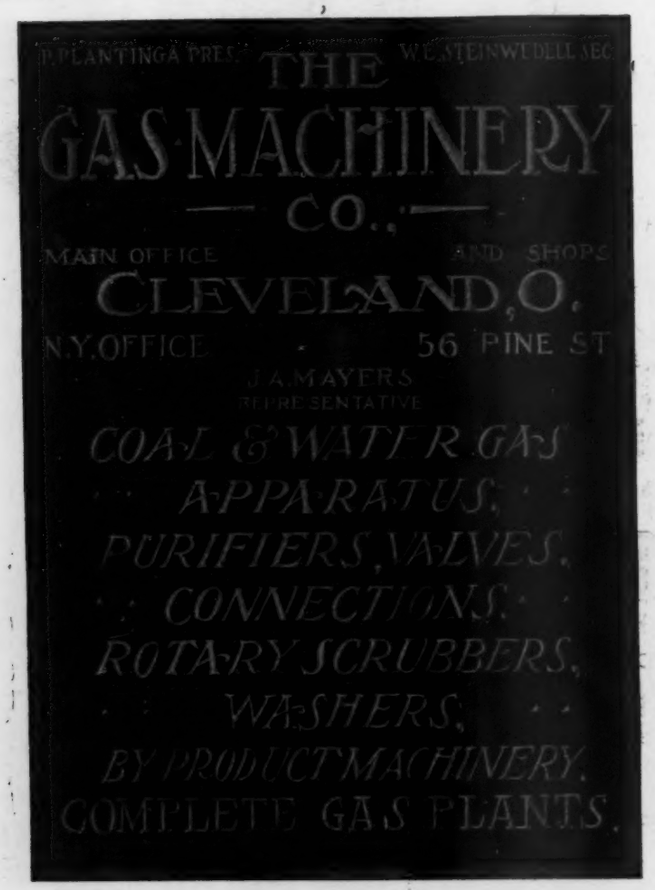

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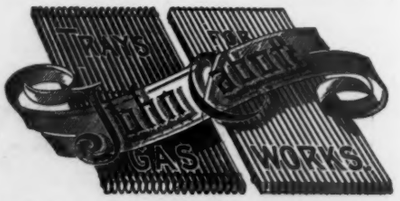

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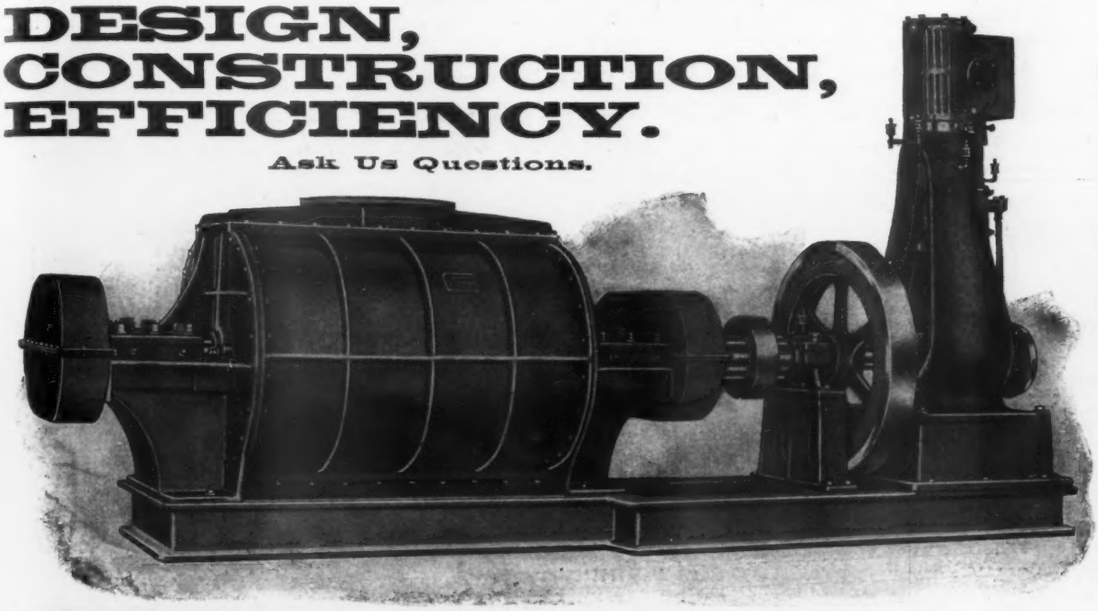

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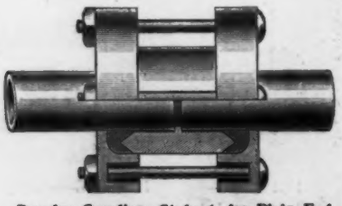

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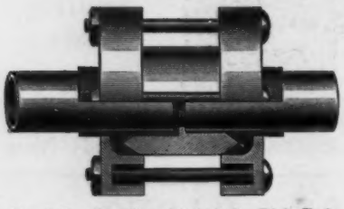

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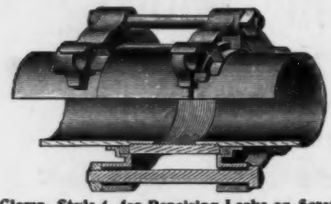

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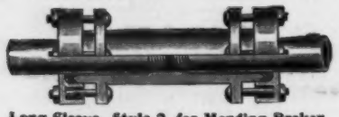

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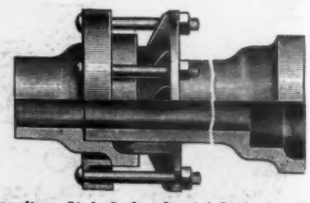

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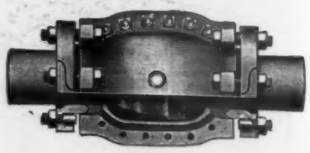

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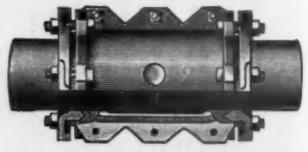

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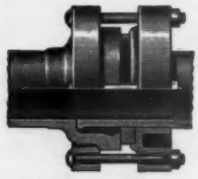

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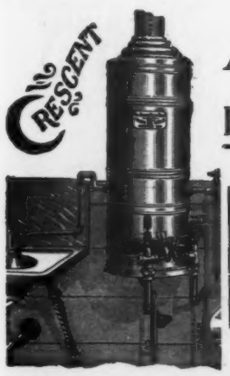

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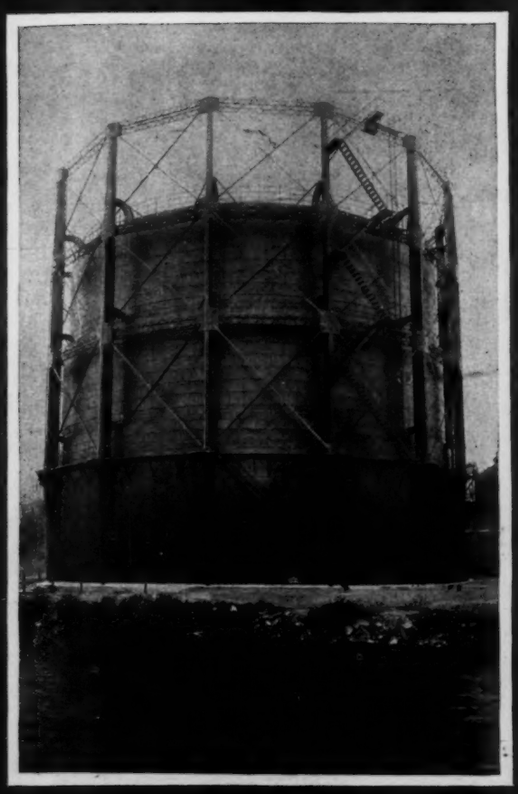

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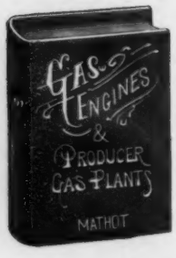

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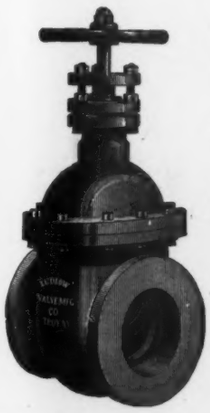

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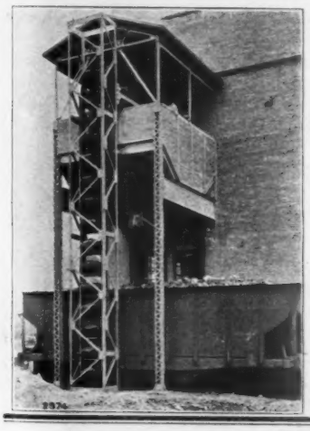

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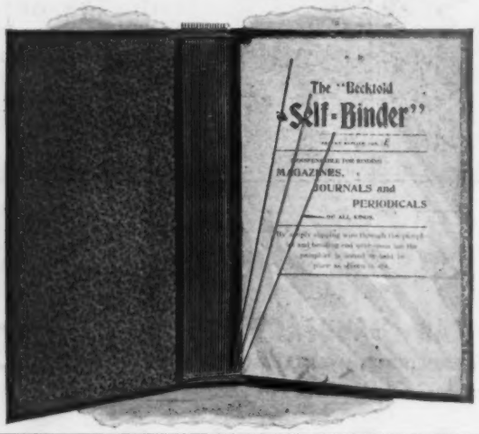

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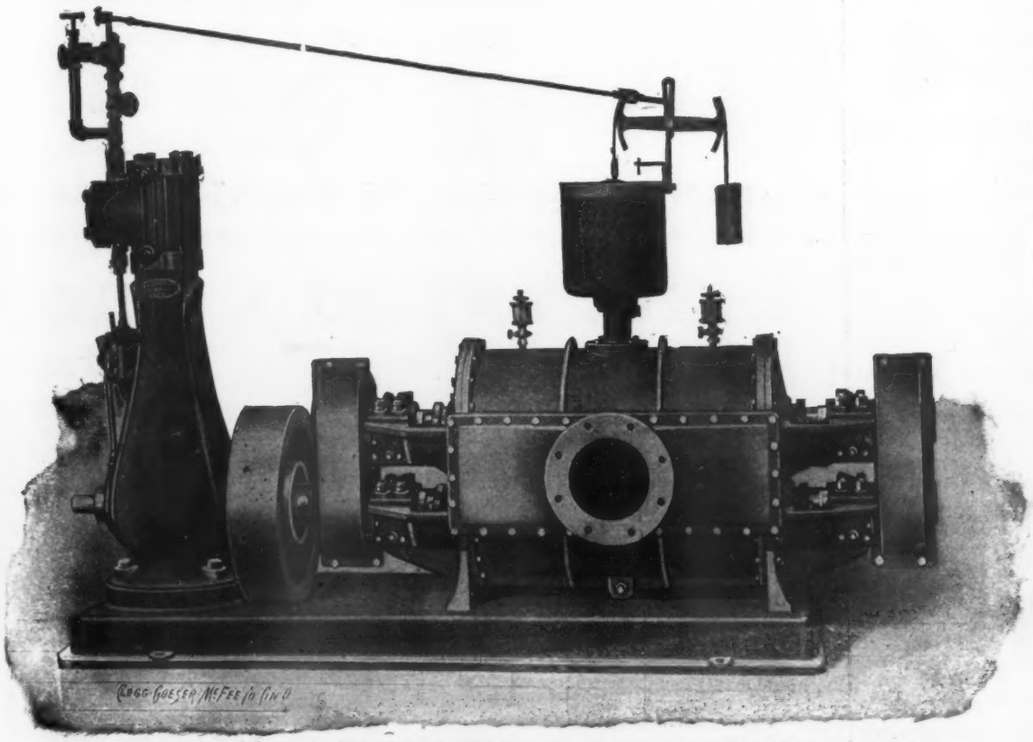

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GIVE US PERMISSION TO SUBMIT A SAMPLE.

Albany Foundry Company,

Manufacturers of the Argand Line of Gas Appliances,

Albany, N. Y.

PHILADELPHIA BRANCH:

HEATH STOVE REPAIR CO., Managers, 136-138 North 2d St.

No. 20-16 and 20-18 Argand Range.

DIMENSIONS.

Depth of top,	24	inches.
Width of top, including two shelves,	38	"
Height of Range,	24	"

GEORGE ORMROD, Mangr. & Treas., Emaus, Pa
JOHN DONALDSON, Prest., Betz Bldg., Phila., Pa.

EMAUS PIPE FOUNDRY.

DONALDSON IRON COMPANY. EMAUS, PA.

CAST IRON GAS & WATER PIPE

MANUFACTURERS OF

CAST IRON PIPE AND SPECIAL CASTINGS

FOR WATER AND GAS.

Also, FLANGE PIPE, LAMP POSTS, Etc.

GAS TAPPING MACHINES

—FOR—

Drilling and Tapping Pipe under Pressure

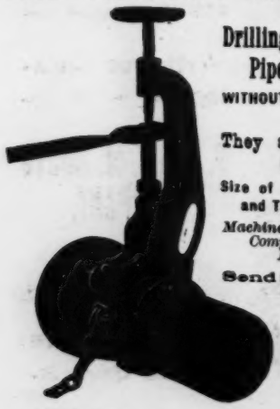
WITHOUT ANY ESCAPE OF GAS.

They are Strong and Compact.

Size of Combination Drills and Taps ¾ to 4-inch.

Machines Sent to any Gas Company for Thirty Days' Trial.

Send for Circulars.



Geo. Light,
DAYTON, O.

MUELLER GAS MAIN TAPPING MACHINE.

The Mueller "Swivel No. 1," "Swivel No. 2" and "Swivel No. 3" Tapping Machines are made especially for tapping gas mains under pressure. They are made extra heavy in all parts, have extra long ratchet sweep and can be adjusted to any angle or corner of the ditch. The No. 1 taps up to 2-inch, the No. 2 up to 3-inch and the No. 3 up to 4-inch. The "Century" makes taps from ⅛ to 1 inch in high pressure mains. Unconditionally guaranteed. Catalogues upon application.

C—1004.

H. MUELLER MFG. CO.,
Decatur, Ill., U. S. A. New York, N. Y., U. S. A.

"THE MINER"
Globe Street and Boulevard Lamps.

Cheapest and Best

THOUSANDS IN USE WITH INCANDESCENT BURNERS.

Send for Catalogues.

THOMAS T. W. MINER,
821-823 Eagle Av., N. Y.

GASHOLDER TANKS AND GAS WORKS MASONRY COMPLETE.

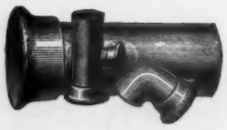
Plans prepared and Estimates furnished at short notice.

J. P. WHITTIER,
238 Java Street, Brooklyn, N. Y.

WARREN FOUNDRY AND MACHINE CO.,

Established 1856. Works at Phillipsburgh, N. J.

New York Office, 160 Broadway.



CAST IRON WATER AND GAS PIPE,

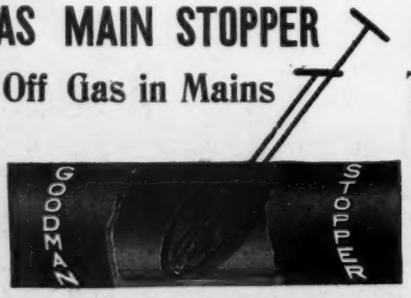
FROM THREE TO FORTY-EIGHT INCHES DIAMETER. ALSO, ALL SIZES OF

Flange Pipe for Sugar House and Mine Work. Branches, Bends, Retorts, etc., etc.

SAFETY GAS MAIN STOPPER COMPANY,

For Shutting Off Gas in Mains

Any size gas main can be shut off in 30 seconds. : : :



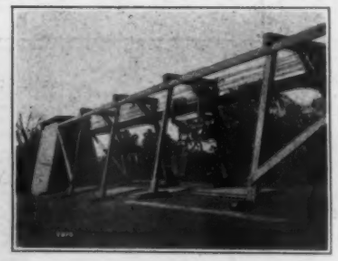
Temporarily during alterations and repairs. : : : :

STOPPERS SENT ON TRIAL.

Address: SAFETY GAS MAIN STOPPER CO., 552 E. 135th St., New York City.

TELPHER

Installed for Jacksonville (Ill.) Gas Light and Power Company.



Telpher travels with coal-filled bucket from storage bin to boiler room, where it is automatically dumped. Then reversing itself, it returns with empty bucket for another load.

Conveying speed is 250 feet a minute and the hoisting capacity one ton at 60 feet a minute.

All kinds of materials can be transported by Telpherage.

Write for Booklet 53.

UNITED TELPHERAGE DEPARTMENT
The Dodge Coal Storage Co.

Philadelphia—Hunting Park ave. and P. & R. Ry.
New York—49 Dey street.
Boston—164 Federal street.
Chicago—39th street and Stewart avenue.
Pittsburgh—1501-2 Park Building.
Portland, Ore.—309 McKay Building.

Chollar's System of Gas Purification.

THE PURIFIED GAS REVIVES THE FOULED OXIDE.

LINK-BELT

OPEN TOP CARRIER.

ESPECIALLY ADAPTED FOR HANDLING

Coal, Coke, Ashes, Stone, Ores,

Or any heavy or gritty materials, where strength and durability are essential. Constructed in any length or capacity, and to suit local conditions.

WRITE FOR CATALOG

The Link-Belt Machinery Co.
Link-Belt Engineering Co. Philadelphia Chicago, U.S.A.

AMERICAN METER CO.,

NEW YORK, ST. LOUIS, PHILADELPHIA, SAN FRANCISCO, CHICAGO,

Photometrical and Experimental Apparatus.

PUBLIC LIGHTING TABLE.

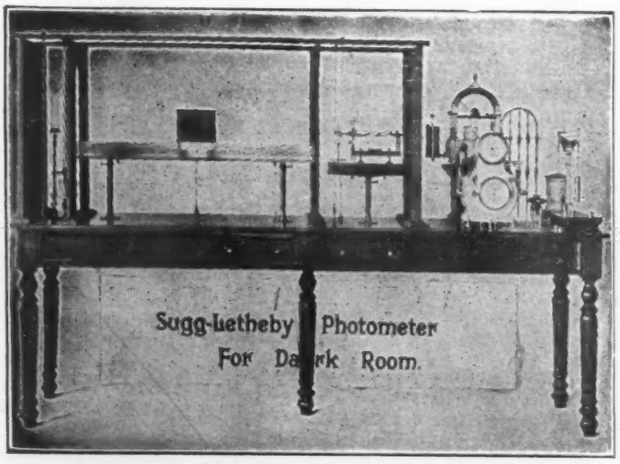
MAY, 1906.

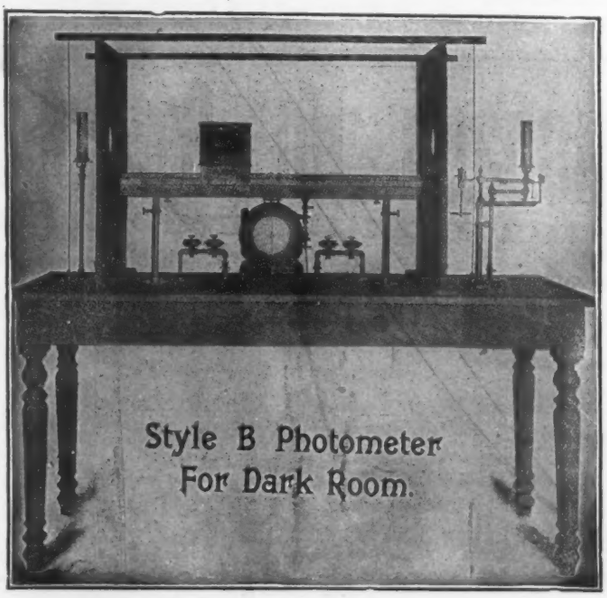
Day of Week.	Date.	Table No. 1. FOLLOWING THE MOON. Light.	Extinguish.
Tue.	1	12.30 AM FQ	4.00 AM
Wed.	2	1.10	4.00
Thu.	3	1.50	4.00
Fri.	4	2.20	4.00
Sat.	5	3.00	4.00
Sun.	6	3.30	3.50
Mon.	7	No L.	No L.
Tue.	8	No L. FM	No L.
Wed.	9	No L.	No L.
Thu.	10	7.30 PM	10.40 PM
Fri.	11	7.30	11.40
Sat.	12	7.30	12.40 AM
Sun.	13	7.40	1.20
Mon.	14	7.40 LQ	2.00
Tue.	15	7.40	2.40
Wed.	16	7.40	3.10
Thu.	17	7.40	3.40
Fri.	18	7.40	3.40
Sat.	19	7.40	3.40
Sun.	20	7.40	3.40
Mon.	21	7.40	3.40
Tue.	22	7.40 NM	3.40
Wed.	23	7.40	3.40
Thu.	24	7.40	3.40
Fri.	25	7.40	3.40
Sat.	26	7.40	3.40
Sun.	27	9.50	3.30
Mon.	28	10.30	3.30
Tue.	29	11.10	3.30
Wed.	30	11.50 FQ	3.30
Thu.	31	12.20 AM	3.30

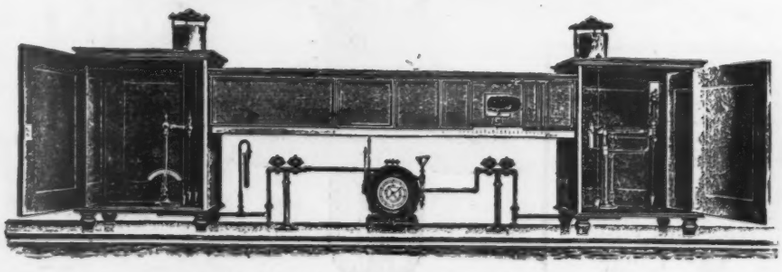
TOTAL HOURS DURING 1906.

By Table No. 1.

	Hrs.Min.
January	223.40
February	190.40
March	192.10
April	167.00
May	152.20
June	142.10
July	150.20
August	157.40
September	170.00
October	185.10
November	201.40
December	214.00
Total, yr.	2146.50







Closed Photometer For Light Room.

CIRCULARS SENT ON REQUEST.

PUBLIC LIGHTING TABLE.

MAY, 1906.

Day of Week.	Date.	Table No. 2. NEW YORK CITY. ALL NIGHT LIGHTING. Light	Extinguish.
		P. M.	A.M.
Tue.	1	6.45	4.00
Wed.	2	6.45	4.00
Thu.	3	6.45	4.00
Fri.	4	6.45	4.00
Sat.	5	6.45	4.00
Sun.	6	6.45	4.00
Mon.	7	6.55	3.40
Tue.	8	6.55	3.40
Wed.	9	6.55	3.40
Thu.	10	6.55	3.40
Fri.	11	6.55	3.40
Sat.	12	6.55	3.40
Sun.	13	6.55	3.40
Mon.	14	7.00	3.30
Tue.	15	7.00	3.30
Wed.	16	7.00	3.30
Thu.	17	7.00	3.30
Fri.	18	7.00	3.30
Sat.	19	7.00	3.30
Sun.	20	7.00	3.30
Mon.	21	7.10	3.15
Tue.	22	7.10	3.15
Wed.	23	7.10	3.15
Thu.	24	7.10	3.15
Fri.	25	7.10	3.15
Sat.	26	7.10	3.15
Sun.	27	7.10	3.15
Mon.	28	7.15	3.15
Tue.	29	7.15	3.15
Wed.	30	7.15	3.15
Thu.	31	7.15	3.15

TOTAL HOURS DURING 1906.

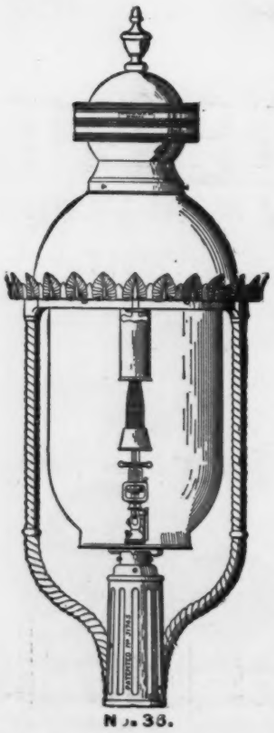
By Table No. 2.

	Hrs.Min.
January	423.20
February	355.25
March	355.35
April	298.50
May	264.50
June	234.25
July	243.45
August	280.25
September	321.15
October	374.30
November	401.40
December	433.45
Total, yr.	3987.45

NEW YORK, 318 West 42d Street. BOSTON, 820 Beacon Building. PHILADELPHIA, Broad and Arch Streets. ST. LOUIS, 712 Roe Building. CHICAGO, 218 La Salle Street. SAN FRANCISCO, 712 Polk Street.

WELSBACH STREET LIGHTING COMPANY

.... OF AMERICA ....



No. 38.

Controls and Operates the

Welsbach System of Street Lighting,

Which includes its specially DESIGNED AND PATENTED BURNER for STREET and PARK LIGHTING exclusively.

Uniformly SUCCESSFUL in 150 Cities and Towns.

By means of the Welsbach System of street lighting the superiority of GAS over electricity for street lighting has been fully demonstrated.

POINTS OF MERIT:

It is { Economical, Attractive, Successful, Up-to-date.

IT LIGHTS THE STREET.

Where there are no gas mains we can furnish an equally good light by our SELF-GENERATING NAPHTHA WELSBACH BURNER, and thereby supply a uniform light in all localities.

Correspondence Solicited from Gas Companies and Others interested in Municipal and Outside Lighting.

No. 35.

The Welsbach No. 6 Harp Fixture.

AN IDEAL LIGHT FOR DINING OR LIVING ROOMS.

THE HIGHEST MECHANICAL INGENUITY COMBINED WITH ORNAMENTAL BEAUTY--THE NEWEST OUTPUT FROM THE WELSBACH FACTORIES.

Equipped with new model No. 66 high candle power Welsbach Burner.

Side Pilot By-pass Tube covered with refractory sleeve to prevent bending.

Fourteen-inch Opal Dome Shade.

Polished Brass Embossed Crown 2¼ inches high.

Length of Fixture, 30 inches.

Width of Harp, 4½ inches.

Finished in Polished Brass.

Packed One Dozen to the Case.

List Price, per Dozen, $45 00.

We recommend equipping the No. 6 Harp Fixture with No. 4197 Intensive Brand Mantle, and the No. 306 **F. Q. M.** Clear Glass Air-Hole Cylinder.

Although the 14-inch Opal Dome Shade is standard equipment, we are prepared to furnish Dome Shades in green, pink or yellow (opal lined), and will be glad to quote prices.

WELSBACH CO.,

Salesrooms in all the principal cities of the United States.

Factories:

GLOUCESTER, N. J.

CHICAGO, ILL.

THE UNITED GAS IMPROVEMENT COMPANY

For the Year Ending December 31st, 1905, has been Awarded Contracts for 40 Sets of

Standard Double-Superheater Lowe Water Gas Apparatus.

PARTIAL LIST OF PLACES:

Catasauqua, Pa.
Plattsmouth, Neb.
Detroit, Mich. (2d contract).
Springfield, Ills.
Oneonta, N. Y. (2d contract).
Pottsville, Pa. (2d contract).
Evansville, Ind. (2d contract).
Lansdale, Pa.
Hempstead, N. Y. (2d contract).
New Britain, Conn.
New York, Mutual Co. (3d contract)
St. Louis, Mo. (4th contract).
Sioux City, Ia. (3d contract).
Amsterdam, N. Y.
Houston, Tex. (2d contract).
Hamilton, O. (2d contract).
Indianapolis, Ind. (2d contract).
Nanticoke, Pa.
Hazleton, Pa.
Mahanoy City, Pa.
Ludington, Mich.
Ossining, N. Y.
Lancaster, Pa.
Flushing, N. Y. (2d contract).
South Bend, Ind.
Fall River, Mass. (2d contract).
Minneapolis, Minn. (2d contract).

TOTAL SETS TO DECEMBER 31, 1905, ... 593
TOTAL DAILY CAPACITY TO DECEMBER 31, 1905, 463,780,000 CU. FT.

The United Gas Improvement Company,

Broad and Arch Streets, Philadelphia.

Established 1858. Incorporated 1890.
CHAS. E. GREGORY, Prest. DAVID R. DALY, V.-Prest. & Treas. H. D. ABERNETHY, Sec.

J. H. Gautier & Co.

Greene & Essex Streets,
Jersey City, N. J.

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CLAY GAS RETORTS, FIRE CLAY TILES, FIRE BRICK and FIRE CLAY SPECIALTIES.

Ground Fire Clay, Fire Sand and Ground Fire Brick in Barrels and Bulk.

SOLE MANUFACTURERS OF THE

FLEMMING ENERATOR GAS FURNACE

Brooklyn Fire Brick Works,

OFFICE AND WORKS:
88 VAN DYKE ST., BROOKLYN, N. Y.
MANUFACTURERS OF

CLAY GAS RETORTS & SETTINGS, GENERATOR LININGS. SPECIALTIES.

ST. LOUIS GAS CONSTRUCTION CO.,

DESIGNERS AND BUILDERS OF

COAL GAS BENCHES,

SPECIAL HIGH GRADE REFRACTORY MATERIAL FOR BENCH SETTINGS AND WATER GAS LININGS.

SOLE AGENTS FOR

CHRISTY SETTINGS.

CORRESPONDENCE SOLICITED.

ST. LOUIS, MO.

FIELD'S ANALYSIS FOR THE YEAR 1904.

An Analysis of the Principal Gas Undertakings in England, Scotland and Ireland. Being the 36th year of publication. Compiled and arranged by JOHN W. FIELD, Sec'y and Gen. Mgr. of The Gas Light and Coke Company, London. Price, $5. For Sale by
A. M. CALLENDER & CO., 42 Pine St., New York City.

ALBERT J. WEBER, President and General Manager.
Established 1846.

Adam Weber Sons.

Manhattan Fire Brick and Enameled Fire Clay Retort Works.

Works at Weber, on the Raritan River. Middlesex County, New Jersey.
GENERAL OFFICES:
Park Row Building, New York City.

Modern Coal Gas Benches,

With either Horizontal or Inclined Retorts, Half-Depth and Full-Depth Recuperative Furnaces.

ADAM WEBER PATENTS

STANDARD BENCH IRONWORK.

Linings for Water Gas Apparatus, High Grade Fire Brick of All Shapes and Sizes, Ground Fire Clay, Ground Fire Brick in Bulk or in Barrels.

ISAAC C. BAXTER, President.
Works.
LOCKPORT STATION, PA.

ESTABLISHED 1864.

JAMES GARDNER, JR., CO.,

Successor to WILLIAM GARDNER & SON.

PETER YOUNG, Secretary and Treas.
Address all communications to
JAMES GARDNER, JR., CO., Room 202 Lewis Bldg
PITTSBURGH, PA.

Fire Clay Goods for Gas Works.

HENRY MAURER & SON,

(ESTABLISHED 1856.)

EXCELSIOR FIRE BRICK & CLAY

RETORT WORKS

WORKS, Perth Amboy, N. J.
OFFICE, 418 to 422 East 23d St., N. Y.

Clay Gas Retorts,

BENCH SETTINGS,

Fire Brick, Tiles, Etc.

GEROULD'S IMPROVED RETORT CEMENT.

A Cement of great value for patching retorts, putting on mouthpieces, making up all bench-work joints, lining blast furnaces and cupolas. This cement is mixed ready for use. Economic and thorough in its work. Fully warranted to stick.

Price List, f.o.b. PITTSBURGH, PA.
In Casks, 400 to 800 pounds, at 5 cents per pound.
In Kegs, 100 to 200 " " 6 " "
In Kegs less than 100 " " 7 " "

C. L. GEROULD,
1200 Bank for Savings Bldg., Pittsburgh, Pa.

NATIONAL PYROGRANIT COMPANY,

MANUFACTURERS OF

Fire Brick, Tiles, Special Shapes, etc.

NEW YORK OFFICE:
17 Battery Place, New York.

WORKS:
South River, N. J.

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BALTIMORE RETORT & FIREBRICK CO.

BALTIMORE, MD.,

Manufacturers of all Material for the Construction of Coal Gas Benches.

HALF AND FULL DEPTH AND FREE FIRING BENCHES,

All styles of which we have in operation, equipped with the BEST of LATEST IMPROVEMENTS, proving our claim for SUPERIOR QUALITY and EFFICIENCY.

INCLINES—We have in SUCCESSFUL OPERATION benches of Inclined Retorts, MANUFACTURED and ERECTED by us.

WALDO BROS., 102 MILK ST., BOSTON, MASS.,
Agents for New England States.

LARGE FACILITIES—Correspondence Solicited.
RAIL and WATER CONNECTIONS to ALL POINTS.

JOHN DELL,
President and General Manager.

MISSOURI FIRE BRICK CO.,

ESTABLISHED 1882.

MANUFACTURERS OF

Gas Retorts, Bench Settings, Fire Brick, Cupola Linings, Etc.

We are the **Exclusive Agents** *for the* **Mitchell Patent Benches,** *Constructed with Half or Full Depth Furnaces, to Burn either Coal or Coke, and Arranged for Front or* **Rear Clinkering.** **The Mitchell** *is the* **Original Coal Firing Bench.** *We also Erect Plain Benches with* **One to Six Retorts.**

YOUR CORRESPONDENCE IS RESPECTFULLY SOLICITED.

City Office: *411 Olive Street, Continental Bank,* ST. LOUIS, MO.

Bronder Patent Stoking Machinery.

Three-Scoop and Three-Rake Charging and Discharging Machines are operating in New York, Newark, N. J., Philadelphia, Worcester, Mass., Mt. Vernon, N. Y., Toronto and Montreal, Canada.

Four-Scoop and Four-Rake Charging and Discharging Machines are operating in Detroit, Mich.

These are the only machines that will draw or charge simultaneously 3 or 4 retorts (vertically) and handle from 42 to 60 retorts in from 25 to 30 minutes, lid opening and closing and filling of furnaces included.

Hot Coke Conveyor, Quencher and Steam Exhauster, operating in Toronto, Canada, working in water-sealed flue, rollers being protected from heat and grit.

COAL CRUSHERS, CONVEYORS AND BINS. TURNTABLES FOR MACHINES.

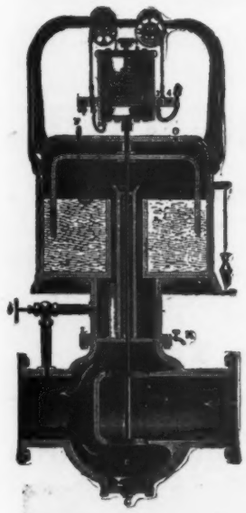
Labor-Saving Machines for Handling Coal and Coke from Coal Cars to Coke Yard or Bins, a Specialty.

G. A. BRONDER,

Contracting Engineer and Builder,

229 BROADWAY, NEW YORK.

CONNELLY IRON SPONGE AND GOVERNOR CO.,



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COAL OR WATER GAS PLANTS,

Automatic, Balance, High Pressure and Service Governors,

Roots Improved Gas Exhausters,

Iron Sponge, Purifying Material for Gas Purification, Jones Jet Photometers, Pressure Registers, etc.,

INSTALLATION OF SMOKELESS TAR BURNING SYSTEM.

Reinforced Concrete Construction for all Purposes,

Wide Experience in High Pressure Installation and Extension,

GAS SPECIALTIES.

395 Broadway, NEW YORK.

295 West 22d Street, CHICAGO, ILLS.

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OF ST. LOUIS, MO.,

PROPRIETORS OF THE

OAK HILL GAS RETORT AND FIREBRICK WORKS.

ST. LOUIS OFFICE: 417 Pine Street. NEW YORK OFFICE: Aldrich Court, 45 Broadway.

WE MAKE A SPECIALTY OF WATER GAS LININGS AND CHECKER BRICK.

Half and Full Depth Benches of Our Own Design, Containing 6, 8 or 9 Retorts.

SLOPERS.—We have perfected plans of INCLINED RETORT BENCHES, designed to meet conditions prevailing in America, and constructed entirely of American materials.

We Build Benches Complete. Ready for Gas Making. Also,

RETORT HOUSES,

COAL and COKE CONVEYING MACHINERY.

Plans, Specifications and Estimates Cheerfully Furnished.

CORRESPONDENCE SOLICITED.

ALL CONTRACTS MADE AS OF ST. LOUIS, MO.

Gold Medals awarded by the Louisiana Purchase Exposition at St. Louis, for fireclay gas retorts, gas retort benches, firebrick and setting tiles.

Newbigging's Handbook for Gas Engineers and Managers. Price, $6.50. For Sale by A. M. Callender & Co., 42 Pine St., N. Y. City.

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THE PERKINS COMPANY,

228 and 229 Produce Exchange, New York City.

Ocean Mine Youghiogheny Gas Coal, Old Kentucky Shale and O. K. Boghead.

SHIPMENTS FROM NEW YORK, PHILADELPHIA, BALTIMORE AND NORFOLK.

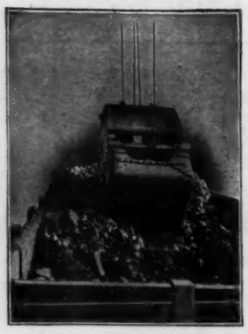
BERWIND-WHITE COAL MINING COMPANY'S

Ocean Westmoreland Gas Coal.

Offices:
Washington Building, New York.
Betz Building, Philadelphia.

STRICTLY High Grade. . . . .
Carefully Prepared.
For Gas Making or
Heavy Steaming.

A. C. M. AZOY, General Agent, 1 Broadway, New York.



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OF
HANDLING COAL
WITH GRAB BUCKETS.

WILL ALSO WORK IN ORE, EARTH, CLAY, STONE, SAND AND BROKEN LIMESTONE.

TAKING MINE-RUN COAL FROM CARS.

FEATURES—SELF-FILLING, WIDE SPREAD, FLAT PATH, GREAT CLOSING POWER.

OUR GRAB BUCKET BOOKLET 77A MAILED FREE, with Catalogues on

ELEVATING-CONVEYING-POWER-TRANSMITTING MACHINERY.

OPEN. FILLED.

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BINDER for the JOURNAL.

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THE CALORIFIC POWER OF FUELS.

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ENGINEERS AND BUILDERS OF GAS PLANTS.

Inclined Benches, own system, Recuperative Furnaces, Exhausters, Exhauster Governors, Condensers, Washers, Coolers, Wet Purifying Plants, Purifiers, Oxide Elevators, Hydraulic and Dry Coke Conveyors.

Special High Grade Material for Recuperative Furnaces.

ees for ARROLL-FOULIS Charging and Discharging Machines and FRONHAUSER Coke Conveyors. OFFICE, 405 KEENE ST. MILWAUKEE, WIS.

KELLER ADJUSTABLE COKE CRUSHER.
Strong, Simple, Durable. Will Crush any Size Desired.
C. M. KELLER,
Sec. & Supt. Gas Lt. & Coke Co.,
Columbus, Ind.
Correspondence Solicited.

BAXTER & YOUNG,
CONTRACTING AND CONSULTING GAS ENGINEERS.

Examination and Values Ascertained of Artificial and Natural Gas Properties.

COMPLETE GAS WORKS ERECTED.

Artificial and Natural Gas Mains Furnished and Laid.

GAS PROPERTIES PURCHASED.

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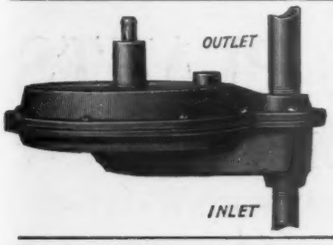

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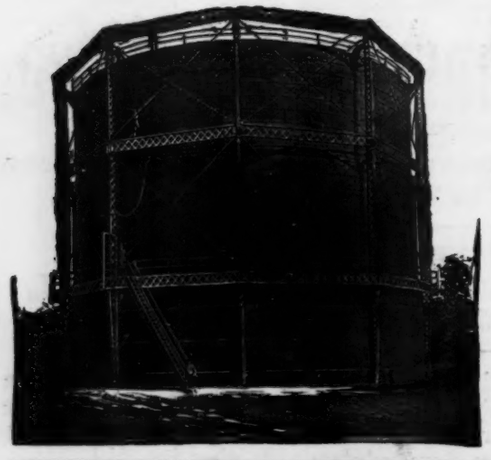

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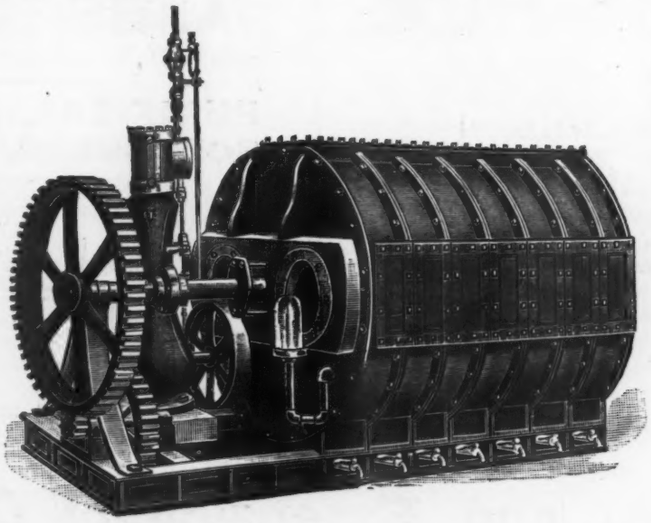

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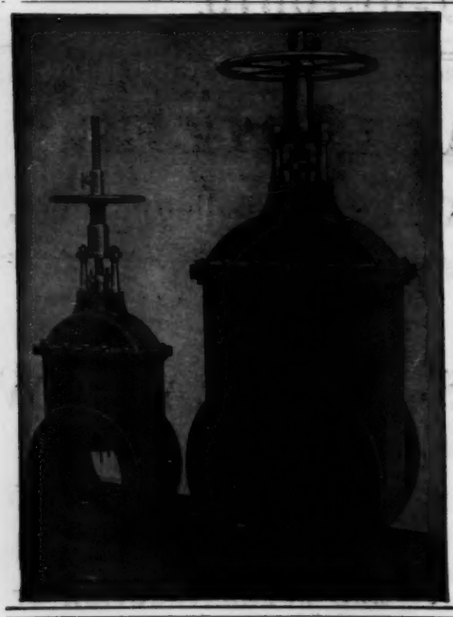

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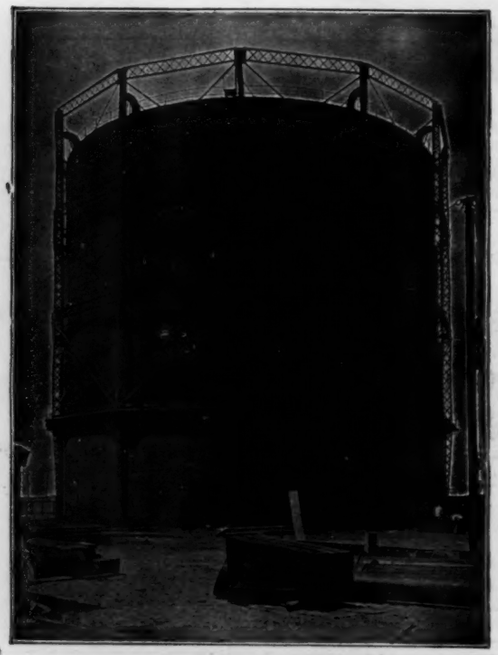

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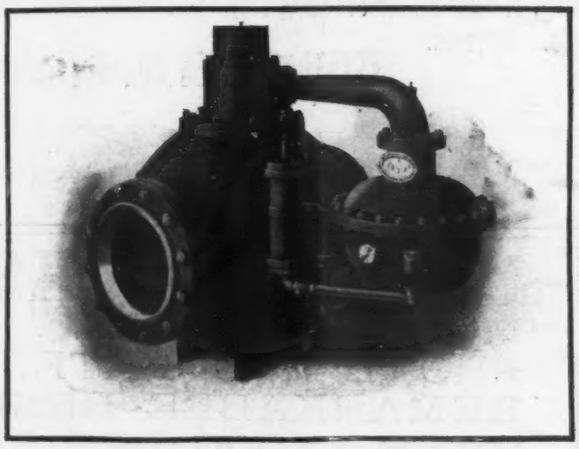

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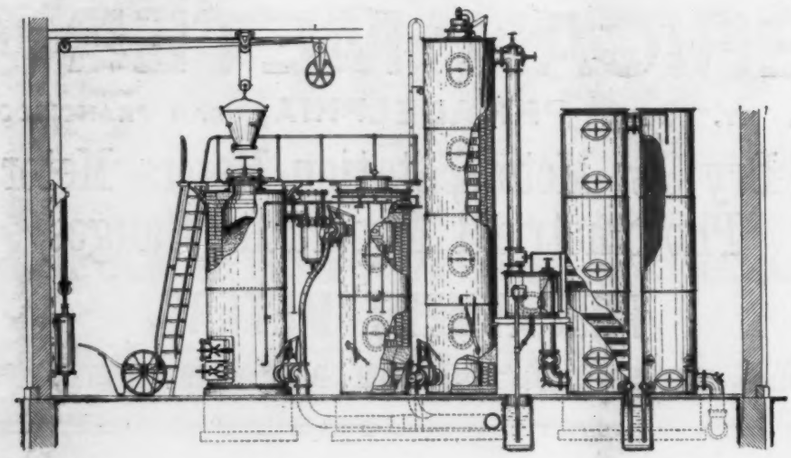

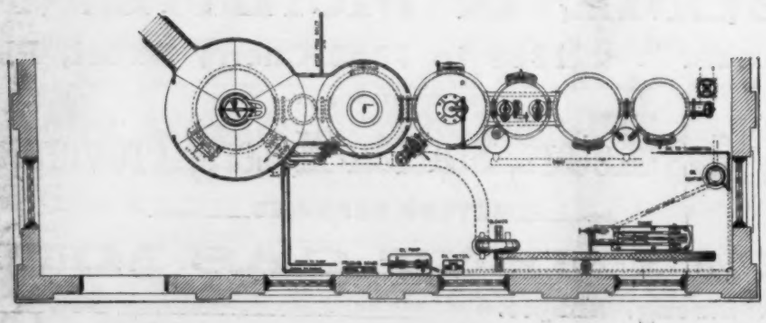

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